

CHAPTER FOUR

ENVIRONMENTAL CONSEQUENCES

4.1 Introduction

This chapter discloses the positive and adverse impacts of the alternatives. Impact analysis assumes that mitigation guidelines contained in Appendix A have been applied on Federal lands and minerals. Where appropriate, this chapter distinguishes between impacts projected to occur on Federal and non-Federal lands and minerals. In many cases, sufficient mitigation has been recommended to eliminate undue impacts on Federal lands and minerals. However, because many of these mitigation measures cannot be imposed by BLM or other regulatory agencies on non-Federal lands and minerals, significant impacts could still occur in the project area even if the recommended mitigation measures are adopted on Federal lands and minerals. Leases issued by the State of Wyoming and agreements between private land and mineral owners and the operators do not contain specific requirements to limit environmental impacts of the nature disclosed in this EIS.

As shown in Section 4.2, the PAPA contains 120 Federal mineral leases. All but 4,730 acres of the Federal minerals in the project area have been leased. These leases grant the operators the right to develop oil and gas contained within the leases. BLM cannot prohibit development of these leases even if the environmental impacts of such development are significant. This EIS develops strategies for the mitigation of adverse effects to affected resources.

This chapter discloses many potentially significant impacts to the natural and human environment. In most cases these impacts are the result of project-related conflicts with sensitive resources that occur in the PAPA. This abundance of sensitive resources has not occurred in other areas of southwest Wyoming where BLM has prepared NEPA documents in the past. By comparison, even though it is contiguous with the PAPA on the south, the Jonah II Field, when compared to the PAPA, is remarkably devoid of sensitive resources. For instance, crucial winter range for big game species, VRM Class II areas, residential areas, wetlands, etc. are generally absent in the Jonah II Field. Similarly, other large development projects that have occurred in southwest

Wyoming in the recent past (i.e., Fontenelle Reservoir and Moxa Arch) were, to a large extent, infill drilling projects. When the NEPA documents were completed for these projects, the dominant land use in these two fields already was oil and gas, and these projects represented expansions of the dominant existing land use. The PAPA has not experienced the level of previous oil and gas development that has occurred in the Fontenelle and Moxa Arch areas. The PAPA is best characterized as currently undeveloped, i.e., 1.6 percent of the area is disturbed (see Table 3-2).

4.1.1 Organization of Impact Analysis. Similar to Chapter 3, the impact discussion is organized by resources described below. However, not all of the impacts are described using all of the sections provided. In some cases, impacts between the various alternatives are essentially the same. In these cases, impacts are described for the alternatives together to avoid unnecessary repetition.

Scoping Issues. BLM conducted extensive scoping for this EIS. Public comments have, to a large extent, determined the scope of this EIS. A condensed list of scoping issues, considered representative of all the comments, is provided at the start of the impact discussion for each resource.

Significance Criteria. Significance criteria were developed to measure the degree to which an impact would affect (positively or negatively) the human and natural environment. Developing significance criteria is difficult for a number of reasons. First, although used extensively throughout the Act, NEPA does not identify what is meant by significant on a resource-by-resource basis. Second, it is often difficult to quantify impacts for some resources. In these cases, significance criteria must be subjective and often rely on the professional opinion of the persons preparing and reviewing the impact analysis. Third, for the reader the significance of an impact is often framed in terms of personal experience. For instance, persons who benefit directly from the positive economic impacts of the project are more likely to consider that positive impact more significant than someone who will not receive direct financial gain. Similarly, someone who recreates in the project area is likely to

find conflicts with project-related activities much more severe than someone who recreates elsewhere. Finally, much is unknown about the future level of development on the anticline. In many cases, the significance of the impacts described in this chapter will directly depend on the level of ultimate development in the PAPA. It is impossible at this point in time to understand what will be the ultimate development level in the project area. Although this document does not predict “worst-case” impacts (i.e., those related to developing the entire field using 40-acre spacing), it may overestimate impacts from the project. For purposes of this analysis, it is assumed that development would occur in all of the SRMZs in the project area, even though much of the project area remains unexplored. This overestimation is unavoidable for complete disclosure of potential or reasonably foreseeable impacts from the project.

Summary of Impacts Common to All Alternatives (Except the No Action Exploration/Development Scenario). This section is used to describe those impacts that could occur from continued exploration and development regardless of which alternative is implemented (except the No Action Exploration/Development Scenario). This section typically describes the general types of impacts associated with drilling of additional wells and construction of ancillary facilities.

Development Scenarios and Levels of Development

Project Wide Exploration/Development Scenario. The Project Wide Exploration/Development Scenario assumes that development would generally occur throughout the entire project area (see Figure 2-1). Each of the alternatives evaluated under this scenario are discussed below as well as the mitigation measures of pad drilling and use of centralized production facilities. Two potential levels of development have been analyzed for each of the alternatives; 500 well pad development level and 700 well pad development level. It is assumed that to reach the 700 well pad development level, 900 well pads would be constructed and drilled and that 200 of the well pads would be abandoned and reclaimed because the wells would be dry holes. Similarly, it is assumed that 650 well pads would be constructed to achieve the 500 producing well pad development level.

Anticline Crest Exploration/Development Scenario. This scenario assumes that most of the development would occur within approximately 1 mile of either side of the anticline crest (see Figure 2-1) and that 3 hot spots would be discovered and developed away from the anticline crest. Approximately 70 percent of the well pads would be located within 1 mile of the anticline and 30 percent of the well pads would be located in the 3 hot spots away from the crest. It was further assumed that an equal number of well pads would be developed in each hot spot. The 2 potential levels of development (500 well pads and 700 well pads) as discussed above for the Project Wide Scenario are also evaluated under this scenario for each of the alternatives described below.

No Action Exploration/Development Scenario. As is required by CEQ guidelines, this scenario is included to describe the impacts of no further development in the project area which will provide a benchmark against which to compare the impacts of the proposed development. Although addressed in this EIS, it is important for the reader to understand that BLM cannot impose this scenario. Because the Federal mineral has been leased, a commitment to allow development has been made. Impacts from this No Action Scenario would generally be restricted to the 41 existing well pads that have been drilled in the project area to date, associated surface and buried pipelines and roads (see Figure 3-2). Disturbances listed on Table 3-2 would likely change very little if this scenario were implemented.

Mitigation Alternatives

Standard Stipulations Alternative. This alternative assumes that either 500 or 700 producing well pads would be developed using BLM’s Mitigation Guidelines (Appendix A) and lease stipulations. Impacts are based on an average of 8 rigs running in the project area year-round. However, unless allowed by lease stipulations, this alternative does not generally limit the density of development (i.e., the number of potential well pad locations/section) within any of the SRMZs. In most cases, it addresses the impacts from locating up to 16 well pads/section in the SRMZs.¹

¹ Section 2.5 explains well spacing and how 40-acre bottomhole spacing equates to 16 well pads/section.

Resource Protection (RP) Alternative on Federal Lands and Minerals. This alternative describes the impacts of implementing the RP Alternative on only Federal lands and minerals. This alternative also assumes that either 500 or 700 well pads would be developed using BLM's Mitigation Guidelines and lease stipulations. It also discloses the types of impacts that would remain even if BLM implements additional controls to reduce undue impacts. It evaluates the benefits of slower paced development by limiting the number of rigs operating annually in the project area to five. Finally, this alternative addresses the application of mitigation measures including pad drilling and centralized production facilities.

Resource Protection (RP) Alternative on All Lands and Minerals. This alternative describes the impacts of adopting RP Alternative mitigation guidelines (Appendix A), stipulations, and additional mitigation measures throughout the PAPA (regardless of land or mineral ownership). Adoption of these controls by the operators on private and state lands and minerals would be strictly voluntary and probably would not occur. Even though this alternative cannot be imposed by BLM or the cooperating agencies, NEPA requires its evaluation in this EIS. CEQ guidance states *"an alternative that is outside the legal jurisdiction of the lead agency must still be analyzed in the EIS if it is reasonable. A potential conflict with local or federal law does not necessarily render an alternative unreasonable, although such conflicts must be considered...Section 1502.14 (of NEPA) requires the EIS to examine all reasonable alternatives to the proposal. In determining the scope of alternatives to be considered, the emphasis is on what is 'reasonable' rather than on whether the proponent or applicant likes or is itself capable of carrying out a particular alternative. Reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant."* It is assumed, under this alternative, that either 500 or 700 producing well pads would be developed. The implementation of mitigation measures (pad drilling and centralized production facilities) is also evaluated.

Additional Mitigation Opportunities. Virtually the entire structure of NEPA compliance has been designed by CEQ with the goal of preventing, eliminating, or minimizing environmental degradation

(CEQ, 1993). Specifically, CEQ regulations require BLM to *"state whether all practicable means to avoid or minimize environmental harm were adopted, and if not, why they were not."* NEPA's purpose is *"to promote efforts which will prevent or eliminate damage to the environment"* (42 USC 4321). This section of the impact discussion contains additional ways in which impacts could be reduced.

CEQ guidance states *"the mitigation measures discussed in an EIS must cover the range of impacts of the proposal. The measures must include such things as design alternatives that would decrease pollution emissions, construction impacts, esthetic intrusion, as well as relocation assistance, possible land use controls that could be enacted, and other possible efforts. Mitigation measures must be considered even for impacts that by themselves would not be considered significant. Once the proposal itself is considered as a whole to have significant effects, all of its specific effects on the environment (whether or not significant) must be considered, and mitigation measures must be developed where it is feasible to do so."*

BLM and the cooperating agencies lack jurisdiction to impose many of the additional mitigation opportunities identified in this chapter. None-the-less, CEQ guidance requires these measures to be identified even if BLM and the cooperating agencies cannot impose them. CEQ guidance states *"all relevant, reasonable mitigation measures that could improve the project are to be identified, even if they are outside the jurisdiction of the lead agency or the cooperating agencies, and thus would not be committed as part of the RODs of these agencies. This will serve to alert agencies or officials who can implement these extra measures, and will encourage them to do so. Because the EIS is the most comprehensive environmental document, it is an ideal vehicle in which to lay out not only the full range of environmental impacts but also the full spectrum of appropriate mitigation."* However, to insure that environmental effects of a proposed action are fairly assessed, CEQ states that the probability of the mitigation measures being implemented must also be discussed. *"Thus the EIS and the Record of Decision should indicate the likelihood that such measures will be adopted or enforced by the responsible agencies."*

Monitoring Recommendations. Where appropriate, additional monitoring requirements are recommended for a number of resources. As stated earlier, monitoring is expected to play a key role in future exploration and development of the Pinedale Anticline. The BLM, cooperating agencies and operators must be able and willing to respond to the results of monitoring (see Section 4.1.3).

4.1.2 General Scoping Concerns (Not Specific to Any Resource). A number of scoping comments were received which address issues not specific to any of the resources discussed in this section. Many of these comments were general in nature and provided support for, or opposition to, the project. Other comments were directed specifically toward general mitigation. These general concerns are listed on Table 4-1 and a response, where appropriate, is provided.

4.1.3 Annual Development Review and Monitoring. CEQ regulations state that a monitoring and enforcement program must be adopted if appropriate for mitigation (40 CFR 1505.2). Regardless of the alternative selected, BLM anticipates that future exploration and development in the PAPA will require monitoring. Monitoring of impacts is appropriate because of the number of sensitive resources in the PAPA and the inability, at this point in time, to accurately predict where economically recoverable reserves of natural gas occur in the project area. Without adequate monitoring, there is no assurance that the mitigation measures recommended in this EIS are actually effective in reducing the impacts. Monitoring programs would be designed and implemented, where appropriate, using the process defined in Appendix F for the Adaptive Environmental Management Plan.

For monitoring to be effective, the results need to be evaluated and used to modify exploration and development activities as necessary. The point of such an evaluation is to suggest how changes in exploration and development activities can be made to correct any unnecessary or undue impacts identified by monitoring. Although much data has been collected by monitoring programs in the past, close scrutiny of the data and adequate, real-world response to the results of the data analysis have been, in many cases, lacking. The monitoring data

from this project would be evaluated during an annual development review. This annual review is not intended to impede development of the project area or to require additional NEPA analysis. Rather, it is designed to allow BLM, the cooperating agencies and the operators to evaluate, on a regularly scheduled basis, how development is proceeding and what, if any, undue or unnecessary impacts are occurring. Additional NEPA analysis may be necessary. The purpose of the annual development review is to scrutinize the following:

- are impacts predicted in this EIS accurate or are impacts occurring which were not predicted;
- is the severity or the significance of the impacts different than those predicted in this EIS;
- using information gathered from wells drilled during the review period, what areas have been discovered which will be subject to intensive development and which may not see any further exploration - what SRMZs occur in both of these areas;
- are new technologies available for further reducing impacts that are both technically and economically feasible (particularly drilling and remote operating technologies); and
- are the mitigation measures and monitoring programs developed for the Adaptive Environmental Management Plan (see Appendix F) insufficient, overkill or adequate to address the impacts that are actually occurring on the ground.

The results of the monitoring programs would be incorporated into the annual development review. BLM would use the monitoring results to guide refinement of the mitigation measures contained in this EIS. For instance, annual surveys for sage grouse and raptor nests should be conducted in the entire project area. If, upon review of the survey results, additional nest sites are located, appropriate steps would be taken so that no activities occur within the specified protective buffers during the nesting season. As a second example, annual monitoring of attendance at sage grouse leks would be used to determine whether the leks are active or inactive and to evaluate the adequacy of buffers around each of the leks.

BLM and the cooperating agencies lack the resources to adequately implement the monitoring programs recommended in this chapter. While the

**Table 4-1
General Concerns Raised by the Public During Scoping**

General Concern	Response
General Reasons for Supporting the Project	
<i>natural gas is important to air quality - it is cleaner burning than coal and oil</i>	See Section 1.2. BLM recognizes that natural gas is a much cleaner fuel than oil or coal.
<i>project is economically important to the state of Wyoming and the local governments</i>	Section 3.5.7 demonstrates that mineral production is a major contributor of revenues to Sublette County and the state. See also Section 3.5, statement from Rose Skinner, Mayor of Pinedale.
<i>protect the environment and proceed with development as quickly as possible - Wyoming and the local communities need the jobs and revenues this project will generate</i>	The project will contribute significantly to local and state revenues (see Section 4.4). However, the pace and timing of development will influence the level of impacts. This issue is discussed throughout Chapter 4 and several of the recommended mitigation measures involve delaying implementation of certain development actions (i.e., seasonal restrictions).
General Reasons for Opposing the Project	
<i>it is not fair to burden the region further with another drilling project like the Jonah Field Project</i>	It is the policy of the United States that the public lands be managed on the basis of multiple use including implementation of the Mining and Mineral Policy Act of 1970 as it pertains to public lands. Refer to Section 102 of the Federal Land Policy and Management Act.
<i>stop oil and gas extraction and begin developing solar energy technology and production</i>	Section 1.2 describes the role that natural gas currently plays in our national energy budget (i.e., natural gas is already the dominant energy source for home heating in the United States). Specific actions outlined in the Comprehensive National Energy Strategy include increasing domestic natural gas production. This comment is directed toward our national energy policy and cannot be addressed in this EIS.
<i>Federal Land Policy and Management Act states that not every piece of land has to be developed</i>	The issue regarding the ability of the BLM to deny access to 40-acre bottomholes in the tight gas sands of the project area is described in Section 2.3. For this project, BLM believes that four well pads/section is the minimum surface spacing that can be imposed to develop Federal leases and not cause an infringement upon lease rights.
<i>if other resource values, such as recreation, are threatened by gas development activities within certain portions of a natural gas lease, then these activities should be modified, even omitted, so that the other values are preserved</i>	See above. This statement is inconsistent with decisions of the Interior Board of Land Appeal and other Federal courts regarding potential conflicts with oil and gas leases and environmental resources (see Section 2.2.3 and Sierra Club vs. Peterson [(717 F. 2d 1409, 1983)]. Irregardless, because the lands are leased, BLM is obliged to allow development in a manner which "protects other natural resources and environmental quality ... and which results in maximum ultimate economic recovery of oil and gas with minimum waste" (43 CFR 3162.1).
<i>project area should be managed as a habitat preserve and scenic sanctuary with no development activities</i>	The project area has not been designated as a habitat preserve or scenic sanctuary. In addition, all but a small portion of the PAPA has been leased for oil and gas development. The operators have a right to develop the leases.
<i>address the need for the project - there is a worldwide glut of gas</i>	There is no evidence of a world wide glut of natural gas. To the contrary, markets are available for all of the gas produced from the PAPA (i.e., the operators have not had to shut in any wells because they could not sell the gas). Section 1.2 describes the projected growth of the natural gas market in response to public demand. The American Gas Association anticipates a 40 percent increase in natural gas consumption by 2015. Continued strong demand for natural gas throughout the United States indicates that there is adequate need for the project. The project also conforms with the Comprehensive National Energy Strategy. See above.

**Table 4-1
Continued**

General Concern	Response
Pace and Level of Development	
<i>development is occurring too quickly</i>	This is a relative statement. To date, because of BLM's May 7, 1998 decision, exploratory drilling on the anticline has been very limited. Development in the Green River Basin is at a maintenance level as noted during the exploratory drilling public meeting.
<i>development should proceed with as much caution as possible</i>	See the descriptions of the RP Alternatives and the mitigation measures proposed for each resource.
<i>consider a phased approach to development</i>	In essence, BLM is considering phased development of the project area. Section 4.1.3 describes how BLM would conduct annual development reviews to determine what adjustments, if any, are necessary to further reduce impacts from the project. Also see the description of the RP Alternatives in Section 2.7.2.
<i>evaluate incremental development on a smaller area</i>	This recommendation is contradictory to rights granted the operators in their Federal leases and is not practicable or possible where multiple leases are involved. See Section 2.3.3.
<i>any development in this area should be extremely limited and on a very small-scale test basis</i>	This recommendation is contradictory to rights granted the operators in their Federal leases and is not practicable or possible where multiple leases are involved. See Section 2.3.3.
<i>BLM's May 7, 1998 decision severely limited the operators ability to explore resources in the project area - because of these limits it is impossible to predict the number of wells associated with field development</i>	Agreed. However, BLM could not issue additional APDs because of the potential for significant impact to the environment. See Section 1.1. Seismic surveys are available to the operators, however, in the absence of adequate drilling it has limited utility.
<i>without adequate exploration operators will be required to overestimate number of wells</i>	BLM recognizes that the operators have not been able to develop a typical "proposed action" for this project. See above response.
<i>if development occurs at 8 wells per square mile, the Mesa will be so saturated with well pads, pipelines, and roads that there will be little left for any other use</i>	This general concern is addressed for each of the resources in Chapter 4. This EIS concludes that many of the impacts are directly dependent on the density of well pads and level of human activity.
Issues Regarding Project Design	
<i>require pad drilling</i>	If 40-acre bottomhole spacing proves necessary, development drilling for the RP Alternatives would require pad drilling in certain SRMZs.
<i>centralize facilities to avoid impacts associated with needless duplication</i>	Pad drilling costs provide incentives for use of centralized production facilities. The EIS suggests that centralized production facilities may be necessary to reduce impacts in visually sensitive areas adjacent to the Lander Trail and in VRM Class II areas, and to reduce impacts to wintering big game and sage grouse nesting (see Table 2-6).
<i>directional drilling should be required</i>	Where economically and technically feasible, directional drilling could be used by the operators to avoid sensitive areas.
Concerns Regarding Mitigation and Monitoring	
<i>will operators agree to implement mitigation measures regardless of land ownership</i>	To date the operators have been unwilling to commit to implementing mitigation measures on all lands. However, the RP Alternative on All Lands and Minerals demonstrates the reduction in impacts associated with applying mitigation measures on non-Federal lands and minerals.
<i>operators should willingly place limits on themselves to protect resources</i>	Operators could voluntarily do this.
<i>operators should establish a fund to purchase conservation easements in the area</i>	A mitigation fund is recommended in Section 4.19.4. However, BLM and cooperating agencies cannot force the operators to participate in this type of fund. Any participation would be strictly voluntary.
<i>operators should be required to post "large" bonds to guarantee control of pollution to protect waters, air quality and aesthetic vistas</i>	The operators are required and do have bonds posted with the U.S. Department of the Interior. Bonds are for the purpose of covering operator default for any surface disturbing activity on Federal lands (e.g., reclamation, down hole plugging problems, etc.)

**Table 4-1
Concluded**

General Concern	Response
<i>independent consultants should be used to oversee construction and environmental monitoring</i>	BLM believes that the operators are best suited for implementing construction and environmental monitoring. BLM and the cooperating agencies, however, will participate in every aspect of monitoring to assure that the programs are providing data useful to mitigating impacts from further exploration and development.
<i>eco-royalty credits should be implemented as an incentive to maximize mitigation efforts to avoid cumulative adverse impacts</i>	BLM will consider whether a properly-implemented royalty relief program could be effective for this project.

BLM and cooperating agencies need to be thoroughly involved in all aspects of monitoring, the costs of these monitoring programs will have to be borne by the operators (see Appendix F). The results of the annual development reviews would be provided to the public by the BLM for review and comment. It is anticipated that public involvement in the annual development review process will include workshops, similar in design to those conducted during scoping for this project.

4.1.4 Mineral Resources Forgone. Selection of certain alternatives would prohibit development of the resource, thereby causing the minerals to be forgone if hydrocarbons are determined to be present. For example, selection of certain alternatives would avoid development in the Residential Area SRMZ, 100 year flood plains, and within stream, wetland and riparian area buffers. This would mean that all of the positive impacts from development of a well described in the socioeconomic section would not be realized.

4.2 Federal Mineral Leases in the Project Area

Before analysis of impacts are presented, it is important to understand the status of Federal mineral leases in the project area. The PAPA contains 164,415 acres of Federal minerals. Of that, all but 4,730 acres have been leased. In other words, the operators have the right to develop oil and gas on all but about three percent of the Federal minerals in the project area. As was discussed in Chapter 2, by leasing the minerals the government recognized that development would occur even if that development resulted in significant adverse impacts to the human environment. Of the 4,730 acres that are not currently leased, 1,505 acres (or about 1 percent of the PAPA) have been designated as unavailable for leasing. Figure 4-1 shows the location of Federal minerals in the project area which are currently leased and those which are not leased.

When the BLM leases a mineral parcel for oil and gas development, the agency can attach protective stipulations to the lease. These "lease stipulations" can apply to all or only a portion of the lease. These stipulations are binding on the party that leases the mineral rights for that parcel. The impact analysis contained in this chapter assumes that the lease stipulations are adequately implemented. Most of these stipulations are designed to protect environmental resources. Some of the stipulations are very restrictive and include conditions that avoid or severely restrict surface disturbing activities on all or a portion of the lease. Some leases do not contain any additional stipulations. Typically, these leases occur in areas where there are few surface constraints or, more commonly, the lease was issued before environmental concerns were recognized. Both types of leases occur in the PAPA.

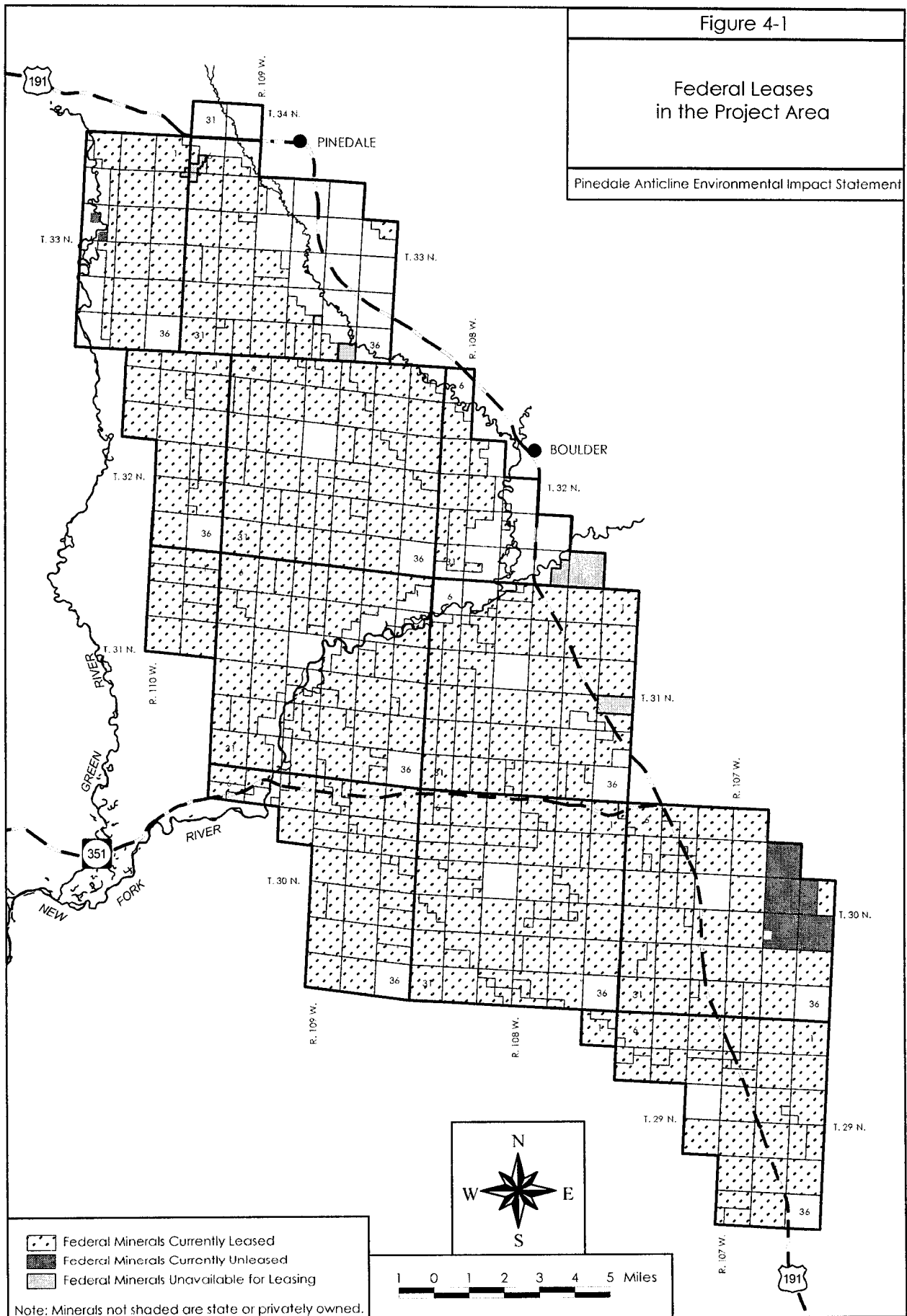
It is important to recognize that just because leases lack environmental stipulations it does not mean that "reasonable" controls can't be included as conditions of approval on an APD by BLM. There is substantial support for the right of the Secretary of the Interior to regulate drilling rights in order to avoid adverse environmental impacts when reviewing APDs. Many restrictions have been reviewed by the courts and generally upheld as an exercise of the Secretary's authority under Section 39 of the MLA. At the APD stage, BLM would impose conditions of approval, as necessary. However, these conditions of approval must be reasonable and must not preclude the operator's right to develop oil and gas from these areas.

On-the-other-hand, a number of leases have been issued by the BLM which contain stipulations that can restrict or avoid surface disturbing activities. Representative examples of these stipulations are listed on Table 4-2. Basically, there are three types of stipulations attached to the leases. The first is a timing limitation stipulation (TLS) that avoids surface

Figure 4-1

Federal Leases in the Project Area

Pinedale Anticline Environmental Impact Statement



**Table 4-2
Summary of Federal Lease Stipulations in the Project Area (1)**

Type of Stipulation	Resource Protected	Stipulation
TLS	Big Game Winter Range	TLS - Timing limitation (2A) - To protect important big game ungulate winter habitat, drilling and other surface disturbing activity will not be allowed during the period from November 15 to April 30. The same criteria applies to elk calving areas from the period of May 1 to June 30. This limitation does not apply to maintenance and operation of producing wells. Modifications to this limitation in any year may be approved in writing by the authorized officer.
NSO	Flood Plain	NSO - No surface occupancy will be allowed on the following described lands (Sec 21: SWSW; Sec 28: SWNW) because of HUD designated zone A (100-year) flood hazard area on perennial water courses.
Prohibited	Flood Plain	Prohibited (3D) - Protect special flood hazard area, within the zone A (100-year) flood hazard area as designated by HUD, district manager reserves the right to prohibit surface disturbance in Sec. 29, lots 3, 4, and 7.
CSU, Restricted or Prohibited	Flood Plain	CSU - Controlled surface occupancy or use within the zone A (100-year) flood hazard area as designated by HUD will be restricted or prohibited unless the operator and surface managing agency arrive at an acceptable plan for mitigation of anticipated impacts.
CSU	Groundwater	CSU - surface use or occupancy by oil and gas development activities and associated facilities will be restricted.
CSU, Restricted or Prohibited	Lander Trail	CSU - Surface occupancy or use within the visual horizon or 1/4 mile (whichever is closer) of the Lander Trail will be restricted or prohibited unless the operator and surface managing agency arrive at an acceptable plan for mitigation of anticipated impacts.
Prohibited	New Fork Campground	Prohibited (3A) - In order to protect the New Fork River Campground, the district manager reserves the right to prohibit surface disturbance within 1/4 mile in T30N, R109W, Sec: 5, lots 2-5. This limitation does not apply to operation and maintenance of producing wells. Modifications to this limitation may be approved in writing by the authorized officer.
Prohibited	Occupied Dwellings	Prohibited (3F) - In order to protect occupied dwellings, the district manager reserves the right to prohibit surface disturbance within 1/4 mile. This limitation does not apply to operation and maintenance of producing wells. Modifications to this limitation may be approved in writing by the authorized officer.
CSU, Restricted or Prohibited	Raptor Nest	CSU - Surface occupancy or use between February 1 and July 31 within a radius of up to 1 mile of occupied or active raptor nest sites will be restricted or prohibited unless the operator and surface managing agency arrive at an acceptable plan for mitigation of anticipated impacts.
CSU, Restricted or Prohibited	Raptor Nest	CSU - Raptor nest surveys will be conducted within a 1 mile radius or linear distance of surface uses or activities proposed between February 1 and July 31. Surface occupancy or use within 1 mile of occupied and/or active nest sites will be restricted or prohibited unless the operator and surface managing agency arrive at an acceptable plan for mitigation of anticipated impacts, in accordance with FWS guidelines.
CSU, Restricted or Prohibited	Raptor Nest	CSU - Surface occupancy or use between February 1 and July 31 within 1/2 to 1 mile of occupied and/or active raptor nest sites will be restricted or prohibited unless the operator and surface managing agency arrive at an acceptable plan for mitigation of anticipated impacts.
TLS	Raptor or Sage Grouse Nesting Habitat	TLS (2B) -To protect important raptor and/or sage and sharp-tailed grouse nesting habitat, drilling and other surface disturbing activity will not be allowed during the period from February 1 to July 31 within certain areas encompassed by this lease. This limitation does not apply to maintenance and operation of producing wells. Modifications to this limitation in any year may be approved in writing by the authorized officer.
CSU, Restricted or Prohibited	Sage Grouse Lek	CSU - Surface occupancy or use within 1/4 mile of a sage grouse strutting ground will be restricted or prohibited unless the operator and surface managing agency arrive at an acceptable plan for mitigation of anticipated impacts. Surface use and human activity will not be allowed within a 1/2 mile radius of active leks between midnight and 9:00 am from March 1 to May 15. These restrictions may apply to the operation and maintenance of production facilities, as well as development activities.
NSO	Sage Grouse Lek	NSO (2C) - No surface occupancy will be allowed on that portion of the lease within the area (Sec 29: E2NE) for the purpose of protecting sage grouse strutting ground habitat. Modification to this limitation in any year may be approved in writing by the authorized officer.
NSO	Sage Grouse Lek	NSO (2C) - No surface occupancy will be allowed on that portion of the lease within the area (Sec 34: SWNE, SENW, NESW, NWSE) for the purpose of protecting sage grouse strutting ground habitat. Modifications to this limitation in any year may be approved in writing by the authorized officer.

Table 4-2 Concluded		
Type of Stipulation	Resource Protected	Stipulation
CSU, Restricted or Prohibited	Sage Grouse Lek	CSU - Surface occupancy or use within 1/4 mile of a sage/sharp-tailed grouse strutting/dancing ground will be restricted or prohibited unless the operator and surface managing agency arrive at an acceptable plan for mitigation of anticipated impacts.
Not Specified	T&E Plant	T&E Species/Habitat: <i>Astragalus drabelliformis</i> (bastard draba milkvetch), <i>Cirsium aridum</i> (cedar rim thistle), <i>Oryzopsis contracta</i> (contracted ricegrass).
CSU, Restricted or Prohibited	VRM Class II	CSU - Surface occupancy or use will be restricted or prohibited unless the operator and surface managing agency arrive at an acceptable plan for mitigation of anticipated impacts.
CSU, Restricted or Prohibited	Wind River Front SRMA	CSU - Surface occupancy or use within the proposed Wind River Front Special Recreation Management Area will be restricted or prohibited unless the operator and surface managing agency arrive at an acceptable plan for mitigation of anticipated impacts.
1 = This table is representative of all of the lease stipulations that have been attached to leases in the project area.		

disturbing activities during a certain period of the year. An example is the big game winter range stipulation that generally avoids surface disturbing activities between November 15 and April 30. These types of stipulations generally do not restrict surface disturbance except during critical periods. The second type of stipulation is a controlled surface use (CSU) stipulation which typically avoids certain activities within a specified distance of an important resource. In a number of cases, when the BLM placed CSU stipulations on the leases they reserved the right to restrict or avoid development (see Table 4-2). BLM reserved the right to restrict or avoid development within 0.25 miles of occupied dwellings and sage grouse leks, in the Wind River Front SRMA, within 0.25 mile of the New Fork River Campground, near raptor nests and in VRM Class II areas. The final type of stipulation is the no surface occupancy (NSO) stipulation. These stipulations are important because, even though the BLM has leased the minerals, the lease specifically avoids any surface disturbance on a portion of or all of the lease. Most of the NSOs in the project area are associated with 100-year flood plains and apply to only a portion of the lease.

There are a number of small and non-contiguous² leases in the project area. Figure 4-2 shows an example of a non-contiguous lease. The figure shows all of the parcels included in lease WYW131904. As can be seen, this lease consists of four separate parcels of land. One 40-acre portion of the parcel is nearly 1 mile removed from the next closest parcel. Because this lease does not contain NSO stipulations, BLM is required to allow

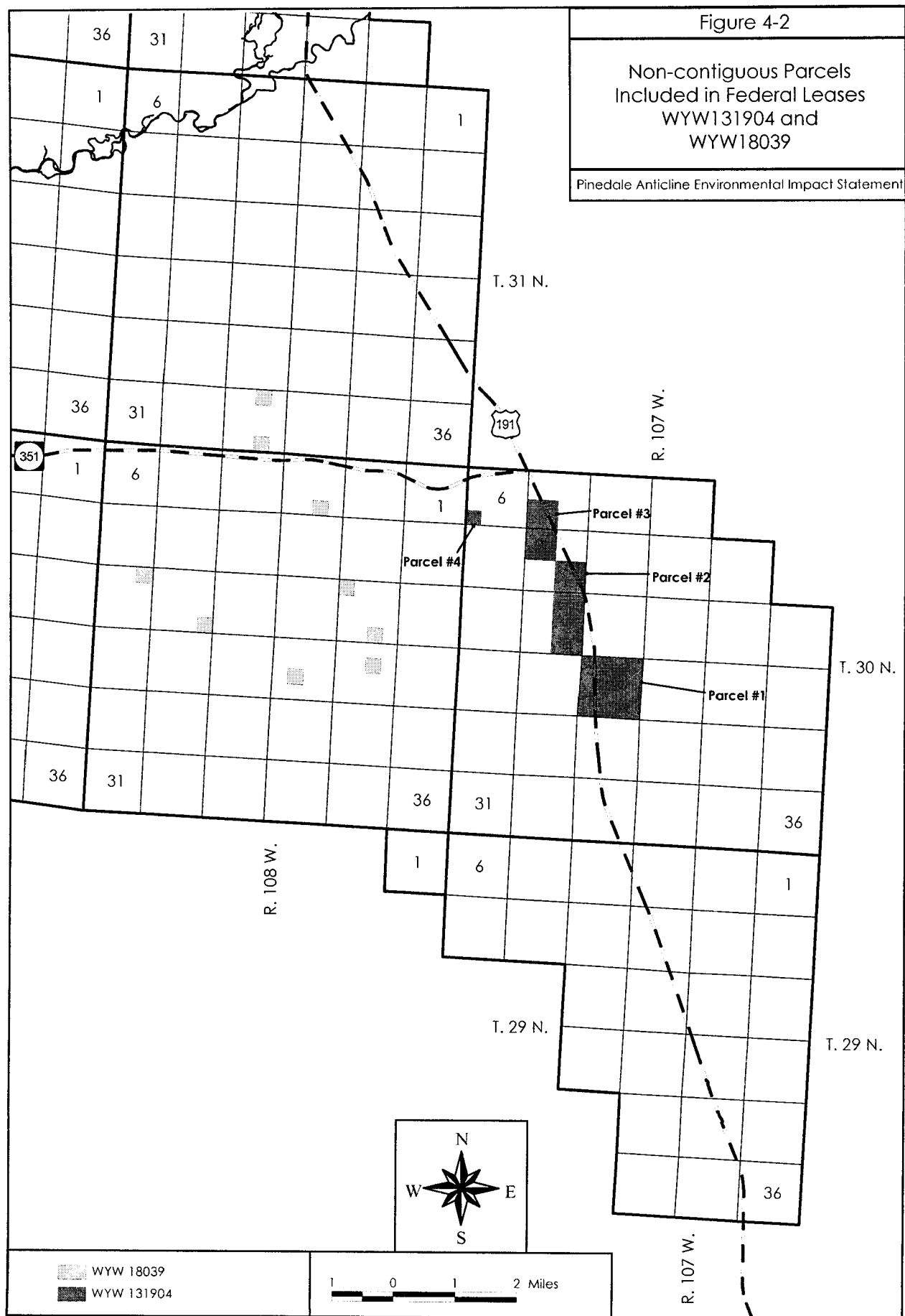
² A non-contiguous lease consists of at least two parcels that are not connected in a contiguous block of land.

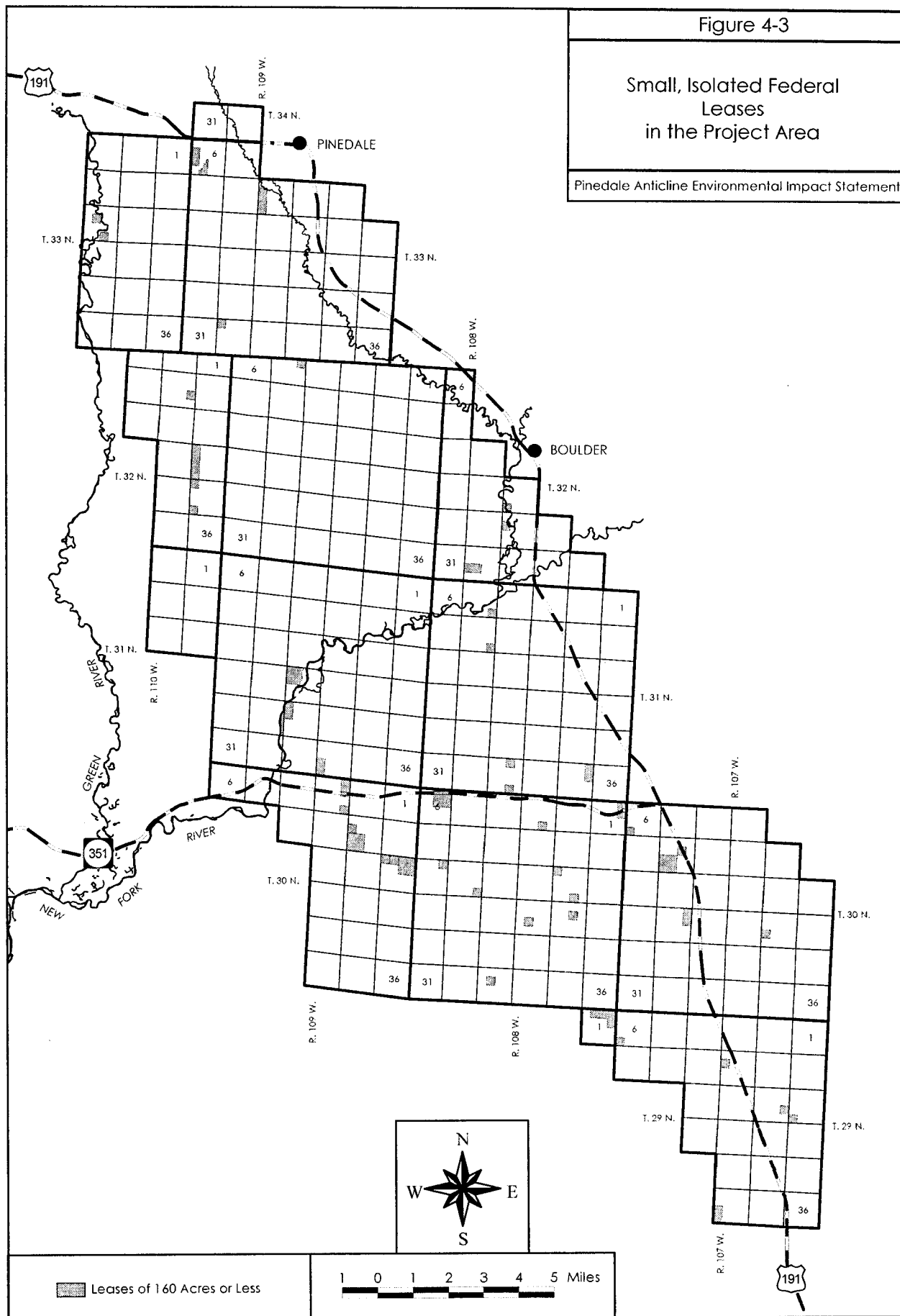
development to occur in each of the four parcels shown on Figure 4-2.

A similar situation exists with lease WYW18039 which consists of nine individual 40-acre parcels. The north and south parcels are nearly 5 miles apart. BLM would be required to allow for the extraction of the leased mineral (place a well pad somewhere on each of the nine 40-acre parcels).

Some have suggested that by allowing development to proceed on just one of the parcels, BLM has satisfied its obligation to allow development of the lease. This is not the case. Absent an NSO stipulation, the operators have been granted a right to develop oil and gas on the entire lease, not just some portion. Because it is not technically or economically feasible to directionally drill from parcel 3 to parcel 4 in lease WYW131904 (see Figure 4-2), a surface well pad location would have to be provided to the operator in both parcels 3 and 4. However, through a unitization agreement among the adjoining lessees, they can unite and collectively adopt and operate under a unit plan. This would mean one company would drill and operate the wells as apposed to two or more companies.

In addition to the non-contiguous leases described above, there are a number of small, isolated Federal leases in the project area. Figure 4-3 shows the locations of all lease parcels 160 acres or less in size. Like the non-contiguous leases, BLM must allow the operators to extract the leased mineral (i.e., install at least 1 well pad on each of the isolated lease parcels shown on Figure 4-3).





4.3 Environmental Justice

On February 11, 1994, President Clinton issued EO 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations." This EO was designed to focus the attention of Federal agencies on the human health and environmental conditions in minority communities and low-income communities. It requires Federal agencies to adopt strategies to address environmental justice concerns within the context of agency operations. The general directive of the EO requires Federal agencies to identify and address, as appropriate *"disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations."* In an accompanying Presidential memorandum, the President emphasized existing laws, including NEPA, should provide opportunities for Federal agencies to address environmental hazards in minority communities and low-income communities. The President's memorandum emphasized the importance of NEPA's public participation process, directing that *"each Federal agency shall provide opportunities for community input in the NEPA process."* Agencies were further directed to *"identify potential effects and mitigation measures in consultation with affected communities, and improve the accessibility of meetings, crucial documents, and notices."*

EPA's Office of Environmental Justice offers the following definition of environmental justice: *The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic group should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies* (EPA, 1998).

The Presidential Memorandum that accompanied EO 12898 calls for a variety of actions. Four specific actions were directed at NEPA-related activities, including

1. Each Federal agency must analyze environmental effects, including human health,

economic, and social effects, of Federal actions, including effects on minority communities, low-income communities, and Indian tribes when such analysis is required by NEPA;

2. Mitigation measures outlined or analyzed in EAs, EISs, or RODs, whenever feasible, should address significant and adverse environmental effects of proposed Federal actions on minority communities, low-income communities, and Indian tribes;
3. Each Federal agency must provide opportunities for community input in the NEPA process, including identifying potential effects and mitigation measures in consultation with affected communities and improving accessibility of public meetings, official documents, and notices to affected communities; and
4. In reviewing other agencies' proposed actions (such as under Section 309 of the Clean Air Act), EPA must insure that the agencies have fully analyzed environmental effects on minority communities, low-income communities, or Indian tribes including human health, social, and economic effects.

Environmental justice issues encompass a broad range of impacts, including impacts on the natural environment as well as social, cultural, and economic impacts. There is no standard formula for how environmental justice issues should be identified or addressed. However, CEQ (1997) provided six principles as general guidance. The first principle states: *Agencies should consider the composition of the affected area, to determine whether minority populations, low-income populations, or Indian tribes are present in the area affected by the proposed action, and if so whether there may be disproportionately high and adverse human health or environmental effects on minority populations, low-income populations, or Indian tribes.*

There are no minority populations, low-income populations, or Indian tribes in the area affected by any of the alternatives (i.e., Sublette County). According to the Bureau of Census, the 1990 racial composition of Sublette County was predominately (nearly 97 percent) white (see Table 4-3).

In light of all the facts and circumstances, the BLM has determined that none of the alternatives would result in a disproportionately high and adverse

human health or environmental impact on minority populations, low income populations, or Indian tribes.

<p align="center">Table 4-3 1990 Census Racial Composition of Sublette County</p>		
Race	Number	Percent
White	4,750	96.9
Black	5	0.1
American Indian, Eskimo, or Aleut	70	1.4
Asian or Pacific Islander	13	0.3
Other race	5	0.1
Hispanic origin (of any race)	57	1.2

4.4 Socioeconomic Resources

4.4.1 Scoping Issues. A number of concerns regarding impacts (positive and negative) were received during scoping for socioeconomic resources. Generally, the comments were divided between those that emphasized the project's positive economic impacts (i.e., revenues and jobs) and those that were concerned about the costs of additional services which may be incurred by local governments and potential conflicts with tourism (including recreation and wildlife uses). A summary of comments related to socioeconomic resources is provided below:

1. Look at the positive impacts of development - identify positive socioeconomic impacts by way of jobs and taxes.
2. Follow the dollars generated by the project and if more restrictive alternatives are considered, address the loss of revenues to state and local governments.
3. Consider employment and royalty and tax revenues from the Jonah II Field.
4. What will the costs of development be to local governments (increased road maintenance, schools, police, health, etc.)?
5. Will development affect the ability of Pinedale to stop tourists on the way to Jackson and the parks?
6. Require operators to provide funds to be used for community and state investment against social impacts caused by the boom, including the impact of the bust after the construction phase.
7. Recreation continues to be the fastest growing economic sector in Sublette County and represents the primary mechanism for achieving economic diversification.

8. Concerned about boom and bust in Pinedale - the operators should be committed to making impact more steady versus boom growth.
9. Pinedale may need additional medical facilities, emergency medical technicians, additional ambulances, additional housing, and additional schools.
10. Evaluate long-term return to the Wyoming and local economies from the wildlife resources of the area.

4.4.2 Significance Criteria. For socioeconomic resources, a significant impact is defined as follows:

- increased demand for housing resulting from project activities which exceeds supply;
- short- or long-term increases in demand for local government facilities or services which exceed existing capacity and are not offset by adequate revenues from continued exploration and development; or
- a 10 percent change in county government revenues or in county-wide employment.

Based on these criteria, all alternatives, except the No Action Exploration/Development Scenario, are expected to have a significant positive impact on county government revenues (assuming significant recoverable reserves are located and developed in the project area). The positive impact to county-wide employment is not expected to be significant as most of the employment will result from drilling and completion activities which are not expected to rely heavily upon local hires. A few new residents can be expected in Pinedale. However, increased direct and indirect local employment is expected to be negligible. Continued exploration and development is not expected to increase housing demand above that presently available, although some workers may decide to occupy motels in Pinedale, particularly in the winter when rates and occupancy are low. With the exception of ambulance service, increases in demand for local government facilities or services are not expected to exceed capacity. Adequate revenues should be generated by the project to cover any additional costs incurred by local governments.

4.4.3 Alternative Impacts. Socioeconomic impacts associated with this project are expected to be very similar to those presently occurring from development of the Jonah II Field. Development of the anticline would be very different from the types of

projects that resulted in the “boom and bust” economies that southwest Wyoming experienced in the 1980s. During that period, BP Amoco, Chevron and Exxon were actively pursuing development of the Anschutz Ranch East, Painter Reservoir, Whitney Canyon, LaBarge, and Carter Creek fields. Many of these projects were occurring simultaneously. These projects had dramatic impacts on socioeconomic conditions in Uinta, Lincoln, Sublette and Sweetwater counties. The major difference with these projects, when compared to development of the Jonah II Field and the Pinedale Anticline, was the need to install large gas processing plants. The gas recovered from these fields required extensive processing (removal of nitrogen, carbon dioxide, hydrogen sulfide, etc.) before it could be shipped to consumers on interstate gas pipeline systems. Construction of these plants typically required thousands of workers over several years. The need to house these workers often resulted in the construction of large man camps and the temporary population increases sometimes exceeded the ability of local governments to provide adequate facilities and services. Gas from the Jonah II Field and the Pinedale Anticline does not require extensive processing before it can be shipped on interstate pipeline systems. The workforces associated with the Jonah II Field and the Pinedale Anticline projects are much more modest and are primarily associated with relatively short duration drilling and completion activities. For these reasons, continued exploration and development using eight (SS Alternative) or five rigs (RP Alternatives) working year-round in the PAPA is not expected to result in “boom and bust” economic conditions. Therefore, the surrounding communities would experience negligible effect from implementation of this project. In essence, development in the PAPA would tend to keep the existing oil and gas industry healthy and would not represent a new economic activity from a regional perspective.

Because of the uncertainties associated with future development and the largely unexplored nature of the PAPA, a conservative approach to analyzing the positive government revenue impacts was adopted for this EIS. Given that little is known about the project area’s ability to produce economically recoverable natural gas, it is impossible to predict ultimate gas recovery from the PAPA. Without such an estimate, overall revenues from the project are also impossible to predict. However, as indicated by many individuals during scoping, the potential positive

revenue impacts are substantial and need to be disclosed in this document. To address these revenues, the BLM has decided to present the positive impacts associated with development of a single, productive well in the project area (hereafter the “typical” well). The analysis uses a productive well from the Jonah II Field to estimate production for the typical well. This approach fairly demonstrates that one productive well would provide significant revenues to local, state and the Federal government. However tempting, multiplying a single well estimate by 700 (the number of productive well pads evaluated in the project area) is considered inappropriate for a number of reasons (see also Section 3.12.2). First, the information for the typical well presented below is based on a constant, sustained flow rate. However, this has not been the case for most wells drilled to date in the PAPA - production in most wells has declined dramatically in a very short period. Second, there is no guarantee that 700 productive well pads will ever be drilled in the project area. Some suggest a much more modest number is appropriate (perhaps 300 or 350), while others think the number of wells could be much greater (2,000). Because so little of the project area has been explored, no estimate of the ultimate number of wells is currently considered credible. Third, the revenues projected from the typical well are based on a constant gas price of \$1.70/thousand cubic feet (MCF) and \$10/barrel for condensate. Most agree that these prices will continue to fluctuate significantly. Product price will significantly affect the flow of revenues to Federal, state and local governments as well as the operator’s decisions to drill wells.

4.4.3.1 Summary of Impacts Common to All Alternatives (Except the No Action Exploration/Development Scenario).

Revenues. The magnitude of the potential for development of the Pinedale Anticline to provide significant economic benefit to Federal, state, and local governments can probably be best demonstrated by considering revenues currently being generated by the Jonah II Field. It has been estimated (Smith, 1998) that during the years 1995 through 1997, total Jonah II Field taxes and royalties paid from Federal royalty, county ad valorem (property) tax, state severance tax and state conservation tax totaled approximately \$26 million. According to Smith (1998), the 1998 royalties and

taxes generated by the Jonah II Field may be higher than the total of the three previous years, combined.

Like the Jonah II Field, development in the PAPA would generate royalties, ad valorem (property) taxes, severance taxes, conservation taxes and sales/use taxes. Table 4-4 shows the tax revenues which would be generated by the typical well during the drilling phase and during a typical year of production. For estimating purposes, production was assumed to be 2 million cubic feet per day (MMCFD) of gas and 18 barrels/day of condensate on a Federal mineral lease. For the analysis, a constant gas price of \$1.70/MCF and \$10/barrel for condensate were assumed.

	Drilling Phase	Year 3 of Production
Federal royalty	\$0	\$ 155,171
State severance taxes	\$0	\$ 62,999
Ad valorem (property) tax on production	\$0	\$ 66,086
Ad valorem (property) tax on equipment	\$0	\$ 125
Sales tax	\$ 67,000	\$ 144
Conservation tax	\$0	\$ 652
Total	\$ 67,000	\$ 285,177

The typical well would generate gross annual revenues of \$1,241,000 from gas and \$65,700 from condensate for a total gross annual revenue of \$1,306,700. For purposes of analysis, it was assumed that total operating costs of the well (including gas used for operations) would be five percent of production (\$65,335). Operating cost is deducted before the payment of any royalties or taxes, therefore, the typical well would have taxable annual revenue of \$1,241,365. Royalties would be paid on this amount to the Federal government for the typical well because it is located on a Federal lease. State severance tax and ad valorem tax would be paid after royalties are deducted. If the well is located on non-Federal minerals, royalty would be paid to the State of Wyoming or the private landowner depending on mineral ownership.

Table 4-4 shows that the total annual tax and royalty payments from the typical well would be about

\$285,000. After the royalties and taxes are paid, the operators would have a net annual revenue from the typical well of approximately \$1,021,000. The largest payment of tax or royalty would be the Federal royalty payment which is 12.5 percent of the value of the gas and condensate produced (after operating costs are deducted). The typical well would generate approximately \$155,000 in Federal royalty payment (see Table 4-5). Half of the Federal royalty (about \$77,000) would be returned to the State of Wyoming. The State of Wyoming would distribute the returned portion of the Federal royalty from the typical well as shown on Table 4-5.

Total Federal royalty collected	\$155,171
Returned to State of Wyoming (50 percent)	\$ 77,585
State Share Allocated as Follows:	
State highway fund	\$ 23,082
Public schools	\$ 36,853
University of Wyoming	\$ 5,237
Cities and towns	\$ 7,565
Capital construction account	\$ 2,909
Distributed to towns (based on population)	\$ 1,939
Source: Wyoming Revised Statute 9-4601	

As shown on Table 4-4, the largest amount of sales tax revenue would be generated during the drilling phase when drilling materials, taxable services and wellhead and production equipment are purchased. The largest amount of tax revenue which benefits Sublette County government is the ad valorem or property tax on production. This tax is assessed at 100 percent of the market value of the gas and condensate production of the well (after royalty payments are deducted). By contrast, property tax on residences in Sublette County is paid on only 9.5 percent of the market value of the property.

According to Montgomery (1998), the total property tax collected in Sublette County during 1998 was \$22,900,000. Over 75 percent of the total property tax collected was from mineral production. As the value of the mineral production in the county increases, the mill levy tends to decrease, creating a situation in which all other taxpayers (residential, commercial, industrial and agricultural) pay lower taxes. If economically recoverable reserves are

discovered, production from the PAPA could significantly increase the value of mineral production in Sublette County. If so, increased mineral valuation in Sublette County could result in further decreases in tax paid by others.

At a production rate of 2 MMCFD of gas and 18 barrels/day of condensate, the typical well would generate approximately \$66,000 annually in total ad valorem taxes collected by Sublette County. The property taxes (using 1998 mill levy structure) would be distributed as shown on Table 4-6. Over 70 percent of the total property tax collected would be sent to the State of Wyoming School Foundation (approximately \$47,000). The remaining tax (approximately \$19,000) would stay in Sublette County and be distributed as shown on Table 4-6.

Table 4-6 Distribution of Ad Valorem (Property) Tax Collected by Sublette County From the Typical Well During Production	
Total ad valorem tax collected on production	\$ 66,086
Allocated as Follows:	
State of Wyoming Schools (43 mills)	\$ 46,707
Sublette County Schools (3.699 mills)	\$ 4,018
Total Tax Retained by County	\$ 19,379
County General Fund (8.59 mills)	\$ 9,335
Fair (0.23 mills)	\$ 250
Airport (0.09 mills)	\$ 98
Library (0.67 mills)	\$ 728
Museum (0.29 mills)	\$ 315
Recreation (0.39 mills)	\$ 424
Fire (1 mill)	\$ 1,086
Rural Health (2 mills)	\$ 2,172
Weed & Pest (0.277 mills)	\$ 301
Upper Green Cemetery (0.6 mills)	\$ 652
Source: Burns, 1998 and Lankford, 1998	

In the 1998 academic year, school funding in the State of Wyoming changed significantly. 1998 was the first year of full implementation of the school funding program which attempts to equalize school funding throughout the state. Previously, property taxes collected for schools were paid to the school districts in the counties in which the taxes were collected. With implementation of the Equalization Plan, the major portion of tax collected for schools now goes to the State and is then distributed to the counties based on average daily membership (ADM). Consequently, funding for schools is not based on the

amount of property tax collected and this project would have no positive direct benefit to Sublette County schools other than to possibly increase the total amount contributed to the Wyoming School Foundation.

Annual property tax paid on production from 50 typical wells would generate approximately \$1,000,000 to Sublette County which is approximately 10 percent of the 1998 Sublette County total budget. These 50 wells would contribute over \$2 million to the Wyoming School Foundation.

Sales tax paid during the drilling phase of a well would be the greatest source of direct revenue from the project for local governments (towns of Pinedale, Marbleton and Big Piney), whereas the county would receive the greatest tax revenues from property tax paid during the production phase. The operators would pay sales tax on the purchase of equipment, materials, supplies and some services. Supplies and equipment brought into the project area from out-of-state would generate use tax revenue. Table 4-7 shows the distribution of sales tax collected by Sublette County for the typical well.

Table 4-7 Distribution of Sales Tax Collected by Sublette County for the Typical Well During the Drilling Phase	
Total sales taxes collected (4 percent)	\$ 67,000
Allocated as Follows:	
State of Wyoming (73 percent)	\$ 48,910
Sublette County	\$ 9,606
Town of Pinedale	\$ 4,378
Town of Big Piney	\$ 1,791
Town of Marbleton	\$ 2,315
Source: Wyoming Department of Revenue, 1997	

The University of Wyoming (1997) recently completed a study that estimated the per unit economic impacts, in terms of total economic activity³, jobs and personal income earning, for selected economic activities in southwest Wyoming. The results of that study provide information with direct bearing on a number of scoping comments that questioned the relative importance of recreation and wildlife to the local and regional economies. The economic activities evaluated in the University of Wyoming's study include natural gas drilling and production, cattle grazing, and a variety of outdoor

³ Total economic activity is defined as the total of expenditures of the activity and personal income from direct and indirect jobs.

recreation activities. The results of the study are summarized on Table 4-8.

The estimates provided by the University of Wyoming's study should be examined carefully if one is trying to contrast the economic value of these activities with natural gas development from the PAPA. The direct expenditures for drilling and completion are significantly higher for PAPA wells because they are much more expensive to drill and complete than the 7,000 to 9,000 foot wells included in the university's study. Wells in the PAPA are drilled to around 12,000 feet. The production estimate for natural gas in the university's study is based on production of 1MMCF of gas or about half a day's production from the typical well. The study indicated that the total economic activity (direct and indirect) generated in the southwest Wyoming economy from production of 1 MMCF of natural gas was \$1,607.97. The typical well, addressed above, is assumed to produce 2 MMCF of gas daily resulting in over \$3,200 of total economic activity. In addition, 1 MMCF of natural gas production is expected to support 0.004925 direct and indirect jobs in the region. According to the University of Wyoming study, jobs directly associated with gas production had an average earning of \$53,733. For indirect jobs associated with gas production, the average earnings per job was \$23,733. Average direct and indirect earnings are \$29,611 which is about double of earnings associated with the other economic activities evaluated in the university's study (see Table 4-8).

By comparison, the University of Wyoming study evaluated the impact of nonresident summer outdoor recreation in southwest Wyoming. According to the study, a nonresident summer recreation visitor in southwest Wyoming not camping is expected to spend \$57.06 per visitor day. The study predicted that at this expenditure level, direct and indirect total economic activity would be \$84.86/visitor day. One nonresident visitor day supported 0.0012 direct and indirect jobs in the region or one job for every 833 visitor days. Overall average earnings per job associated with nonresident summer visitors was \$12,717. Campers generate considerably less revenue, \$24.19 per visitor day, and it took 2,681 camping visitor days to generate just one job. Overall average earnings per job associated with nonresident campers was \$13,378. Based on the results of the study, it would take an estimated 38 nonresident summer visitor days to equal the total

economic activity associated with one day of production from the typical well. Similarly, it would take nearly 95 camping days to generate the same total economic activity produced from one day of production from the typical well. It is also important to recognize that these recreation activities are seasonal, whereas production occurs year-round.

The University of Wyoming study showed nonresident hunters spent considerably more per day than nonresident summer visitors. In 1995, antelope hunters spent an average of \$225.39 per hunter day. This expenditure resulted in \$319.22 of total economic activity. One nonresident antelope hunter day supported 0.003605 direct and indirect jobs, or one job for every 277 hunter days. Overall, average earnings per job associated with nonresident antelope hunting was \$12,904. Nonresident deer hunters spent considerably less than antelope hunters (average \$130.77/hunter day). Total economic activity was estimated to be \$181.25. One nonresident deer hunter day supported 0.001988 direct and indirect jobs in the region or one job for every 503 hunter days. Overall earnings per job associated with nonresident deer hunting was \$12,711. About 10 nonresident antelope hunter days would generate the same total economic activity as one day of production from the typical well. Nearly 18 days of nonresident deer hunting would be required to equal one day of production from the typical well.

The University of Wyoming study also provides an estimate of the number of hunter days in 1994 for all of southwest Wyoming (Carbon, Sweetwater, Lincoln, Sublette and Uinta counties) by species. Mule deer and antelope, the two species most common in the PAPA, accounted for approximately 21,000 and 12,300 total nonresident hunting days, respectively. By using the total economic activity estimates per hunter day provided in Table 4-8, nonresident antelope hunters would generate \$6.7 million in total economic activity in southwest Wyoming in one year. Nonresident deer hunters would generate nearly \$2.2 million in total economic activity in one year. Combined, the annual total economic activity for all nonresident mule deer and antelope hunters in southwest Wyoming would equal about \$9 million.

All of the grazing AUMs in the PAPA would generate approximately \$0.9 million in total economic activity. About 8 months of production from 1 well

Table 4-8
Economic Impact (in 1995 Dollars) for Selected Activities in Southwest Wyoming

	Measurement Units	Direct Expenditure or Sales	Total Economic Activity	Total Earnings	Total Employment (jobs)	Earnings Per Job
Natural gas production	1 MMCF	\$1,130	\$1,607.97	\$145.83	0.004925	\$29,611
Well drilling and completion (productive)	1 well	\$567,559	\$775,521	\$119,781	5.30	\$22,600
Well drilling (non-producer)	1 well	\$277,792	\$378,156	\$57,746	2.58	\$22,382
Nonresident antelope hunters	one hunter day	\$225.39	\$319.22	\$46.52	0.003605	\$12,904
Nonresident deer hunters	one hunter day	\$130.77	\$181.25	\$25.27	0.001988	\$12,711
Nonresident elk hunters	one hunter day	\$225.18	\$319.61	\$48.74	0.003679	\$13,248
Nonresident moose hunters	one hunter day	\$366.23	\$519.32	\$78.03	0.005875	\$13,282
Nonresident sheep hunters	one hunter day	\$529.79	\$809.67	\$153.98	0.011346	\$13,571
Nonresident anglers	one angler day	\$54.29	\$74.77	\$10.22	0.000842	\$12,138
Nonresident wildlife watchers	one day	\$54.76	\$78.89	\$14.27	0.000997	\$14,313
Nonresident camping visitor	one camping day	\$24.19	\$33.69	\$4.99	0.000373	\$13,378
Nonresident summer visitor	one day	\$57.06	\$84.86	\$15.26	0.001200	\$12,717
Cattle grazing	1 AUM	\$26.55	\$52.22	\$9.49	0.000601	\$15,789

1 = These estimates are based on drilling of wells to only 7,000 to 9,000 feet. Direct expenditures for wells in the PAPA would be significantly higher.

Source: University of Wyoming, 1997.

would generate the same amount of total economic activity.

Housing Demand. Based on development in the Jonah II Field, it is estimated that the majority of the workers would be based out of Rock Springs, Marbleton or Big Piney. They would likely stay in local area motels only during the winter months when it is difficult to travel. This is also a time of high vacancy rates and low rental rates for area motels. They are less likely to stay locally in the summer months when roads are clear and motel rates are high due to the influx of tourists. Vacant motel rooms could be easily found during the autumn-winter-spring months (except hunting season) but would be difficult to find during the summer months. Although the present availability of housing in Pinedale is relatively tight, there are available mobile home pads in Marbleton and Big Piney.

During scoping, some suggested that the project could result in additional demand for permanent housing in the Pinedale area. This could occur if Ultra or the other operators increase permanent staffing. These permanent hires and their families could permanently relocate in the Pinedale or Boulder

areas. However, the number of permanent workers is expected to be relatively small (probably less than 50) and would be added over an extended period of time (several years). The communities would be expected to easily absorb the relatively small permanent workforce associated with the project.

Demand for Services and Facilities. Concerns about the ability of the county to provide the necessary services brought on by increased natural gas drilling and production activities have been raised. Potentially impacted services include schools, rural fire departments, emergency medical services, and law enforcement.

Sublette County School District #1 reports adequate space for expanded student enrollments (see Appendix D, Letter 4). The district has been positively affected by development of the Jonah II Field. The school district is likely capable of educating 150 to 200 additional students with little infrastructure impact on the district. According to the Superintendent (Wilson, 1998), the district's schools were built "with an eye to future growth". While the school district would not benefit directly from additional tax dollars, due to state equalization of

school revenues, the district's revenues would increase if ADM increases.

Sublette County's rural fire districts are funded by the county. According to Blaha (1998), the county's fire departments have adequate equipment, but face a shortage of volunteers. During 1998, Boulder's fire department experienced a significant increase in calls for fire and rescue equipment. Although 1998 was not an active wildfire year, extensive road construction activities contributed to increased calls for service. Big Piney's fire department is experienced in responding to oil and gas fires, but the other fire departments lack familiarity with these types of fires.

Sublette County's emergency medical services (EMS) are funded through the county's Rural Health Care District. At the present time, the county has 25 volunteer emergency medical technicians (EMT) and three ambulances, one of which is 4-wheel drive. Wilson (1998) reports a significant increase in the demand for emergency medical treatment over the past 15 years. Much of the increase in the demand for EMS has been due to increasing recreational (horseback riding and snow machine) and gas field accidents. According to Wilson (1998), gas field accidents often require hospitalization in either Rock Springs or Jackson. This monopolizes the use of an EMT crew and ambulance for 6 to 8 hours, and leaves the remaining EMS short-staffed and ill-equipped to respond to another serious accident. There have been times when all ambulances are busy responding to calls. The EMS believes an additional 4-wheel drive ambulance would be necessary if development continues in the PAPA. If significant development occurs (500 to 700 wells) as predicted by the operators, the county would have sufficient funds collected through ad valorem taxes to pay for an additional ambulance. If significant development does not occur, another ambulance is probably not required. Table 4-6 shows that production from the typical well would generate \$2,172 which would be allocated to Rural Health under the county's 1998 tax levy structure.

Law enforcement services in Sublette County are provided through the county sheriff's office. This office is funded by the county, and the towns of Pinedale, Big Piney and Marbleton. The sheriff's office reports a heavy work load, and is seeking grant funds for a juvenile officer. In 1998, four percent of all calls for assistance received by the sheriff's office

came from the Jonah II Field. The sheriff's office received 550 more calls for assistance in 1998 than they did in 1997; much of this increase is attributed to increased population in the county. Adequate funding from property tax collections should be available to cover the additional costs for law enforcement associated with the project.

Property Values. Although it is impossible to quantify, drilling of wells and the installation of production facilities over the next 10 to 15 years would likely reduce the value of property adjacent to these activities. It is likely that unsold lots would be less attractive than those outside the project area. Unlike other parts of the western United States, people moving to the Pinedale area may not be familiar with oil and gas activities and may choose to reside where drilling and production facilities are not prevalent. The demand for housing in areas with extensive oil and gas development would be expected to decrease.

Compression. Installation and operation of the compressor station would not have any significant adverse socioeconomic impacts. Additional sales/use taxes would be paid for the purchase of the compressors and materials and annual property tax would be paid on the assessed value of the facility.

Sales Pipeline. Construction and operation of the sales pipelines would not be expected to result in significant adverse socioeconomic impacts. Construction would likely be performed by local companies primarily employing area residents. Additional sales/use taxes would be paid on the materials but the amount is unknown at this time.

BP Amoco Field Office. Construction of the BP Amoco Field Office would also likely be performed by local companies employing area residents. Sales/use tax would be paid on the materials and annual property tax would be paid on the assessed value of the facilities. However, it is not possible to predict these taxes at this point in time. Construction and operation of the BP Amoco Field Office would not result in significant adverse socioeconomic impacts.

4.4.3.2 Project Wide Exploration/ Development Scenario

Standard Stipulations Alternative. It was assumed for this alternative that there would be eight

wells in various stages of drilling and development at any one time in the PAPA. Table 4-9 shows the peak workforce required to develop a single well in the PAPA and also the peak workforce taking into account the eight rigs in various stages of drilling in the PAPA. For purposes of estimating socioeconomic impacts (peak workforce), it was further assumed that at any given time, the locations for two wells were being constructed, eight wells were being drilled, fracturing was being conducted on two wells and two wells were being tested/completed. Under such a scenario, and assuming that the peak workforce for each activity is present simultaneously, a peak of approximately 320 workers would be working in the PAPA under the SS Alternative. Peak workforce estimates are the same for both the 500 well pad and 700 well pad development levels.

Activity	Peak Number of Workers for a Single Well	Peak Number of Workers in the Project Area
Location work (including water well)	6	12
Drilling	26	208
Fracturing	40	80
Completion and testing	10	20
Total		320

RP Alternatives. Although the RP Alternatives do not restrict the number of wells drilled in the project area, both RP Alternatives are designed to slow the pace of development. Instead of eight rigs (SS Alternative), these alternatives would limit the number of rigs operating in the project area to 5. While overall revenues collected by local, state and the Federal government would not likely be reduced, the period during which the revenues are collected would be extended by perhaps as much as 50 percent. Such a delay in revenues would not result in unacceptable adverse impacts to government entities, particularly given the extensive revenues being currently collected from the Jonah II Field.

These alternatives would result in the use of pad drilling. Ultra estimates that the additional costs associated with pad drilling to be \$0.28 million/well. If the wells prove as productive as the Jonah II Field wells, they would be capable of producing a net annual after tax earning of over \$1 million. Under this relatively simple analysis, the extra cost of pad drilling

would be paid back to the operators in less than half a year. According to Ultra, the cost of centralized production facilities would be comparable to the cost of separate production facilities at each well location.

The RP Alternatives would decrease peak workforce and demands on housing. Table 4-10 presents estimated peak workforce associated with the RP Alternatives.

Activity	Peak Number of Workers for a Single Well	Peak Number of Workers in the Project Area
Location	6	6
Drilling	26	130
Fracturing	40	40
Completion/Testing	10	10
Total		186

It is assumed that peak workforce for these alternatives would be associated with five rigs drilling, one pad being constructed, one well being fractured and one well being tested/completed. Using these assumptions, and assuming peak workforce for each activity is present simultaneously, up to 186 workers could be present in the project area at any one time.

4.4.3.3 Anticline Crest Exploration/Development Scenario. Impacts for this development scenario are the same as those described above for the Project Wide Exploration/Development Scenario for all of the alternatives.

4.4.3.4 No Action Exploration/Development Scenario. Implementation of this alternative would result in a potential significant loss of additional future revenues to local, state and the Federal government. In addition, many of the private mineral owners in the project area would be deprived of potentially significant revenues. However, because of the Jonah II Field, it is anticipated that even if no further exploration or development occurred on the PAPA, the local governments would continue to enjoy tremendous revenues from oil and gas development in the county. Taxes and royalties would be expected to continue to increase for the foreseeable future as the Jonah II Field reaches full development potential. The county's tax base is expected to become more dependent on revenues from the oil and gas industry,

even if the No Action Exploration/Development Scenario is selected.

4.4.4 Additional Mitigation Opportunities.

Even though no significant adverse impacts to socioeconomic resources have been identified, several mitigation measures have been identified that would offset the insignificant impacts which may occur (see Section 4.4.4). The BLM cannot impose any of the mitigation measures listed below – their adoption would be strictly voluntary.

Socioeconomic Mitigation Measure 1. The operators could require that all contractors and subcontractors obtain a sales and use tax license specifically for Sublette County and require that all purchases of materials be made on a Wyoming license and taxes remitted under the Sublette County license. This is generally known as the Direct Payment of Tax Technique. This technique would maximize local receipts of sales and use taxes.

Socioeconomic Mitigation Measure 2. If significant development occurs, there may be a need for an additional 4-wheel drive ambulance. The operators, working with EMS, could monitor the situation. If another ambulance becomes necessary and adequate revenues are unavailable within the county, the operators could assist the county in the purchase of an additional ambulance.

Socioeconomic Mitigation Measure 3. The operators could sponsor training for all county fire departments. Response techniques for oil and gas fires are very different than the techniques used to fight other types of fires. The county fire departments and the operators would benefit tremendously if adequate training and a clear definition of roles were established. In addition, the operators may benefit from assisting the volunteer fire departments in attracting new members.

Socioeconomic Mitigation Measure 4. The operators could track local and state tax payments from their activities on the Pinedale Anticline and report these payments during the annual development review workshops.

4.5 Transportation

4.5.1 Scoping Issues. A summary of issues related to transportation received during scoping are listed below:

1. Impacts from increased traffic on all roads including Federal and state highways as well as local roads should be addressed and resolved in a transportation plan.
2. Concerns regarding legal access to the Mesa should be addressed including the addition of new access points, restricting operator traffic on the Mesa Road south of Pinedale, limiting access to the Mesa to one or two approaches and the need for additional turn lanes from highways.
3. Address concerns over the potential for project-related traffic driving at unsafe speeds which would impact local residents, cattle and wildlife.
4. Address potential impacts from road development within the Mesa through sound design including: limiting road development, graveling all roads, utilization of existing two-tracks, design roads so they cause minimal siltation, concerns of slumping along roadcuts and sediment loading in the Green and New Fork rivers.
5. Operators should maintain cattle guards, fences, culverts, etc. and cattle guards should be cleaned out each spring by the operators.
6. Address concerns over impacts from dust, washboards on local roads as well as design loads on county roads.
7. Address concerns over sensitive areas by requiring locked gates to control public access, controlling all oil and gas roads to the public, applying seasonal restrictions to some roads to protect livestock and wildlife and locating roads and pipelines on top of the Mesa and away from fragile soils, cultural areas and critical habitats along the breaks and bottom of draws on the east side of the Mesa. New roads will provide opportunities for ATVs and 4-wheel drive pickups to drive cross country causing impacts to local plant life and erosion.
8. Pipelines should be laid adjacent to roads to the extent possible and competing operators should be obligated to use the same pipeline and road system rights-of-way.

9. Roads on the Mesa should not link up to allow travel from one end of the Mesa to the other and portions of existing two-tracks not suitable for new roads should be reclaimed.
10. Which roads will be cleared of snow and who is responsible for snow clearing.

4.5.2 Significance Criteria. Impacts produced by the alternatives are considered significant if the following occur:

- increased traffic levels on U.S. Highway 191 or State Highway 351 cause a decrease in level of service as defined by the Wyoming Department of Transportation;
- project-related traffic conflicts with existing residential use; or
- project-related traffic would accelerate the deterioration and related maintenance costs of area roads beyond those scheduled by the responsible agency.

If extensive development occurs on the north end of the project area in the vicinity of Pinedale, project-related traffic and dust could result in significant impacts to residents and recreation use adjacent to the Pinedale South and Mesa roads. Subdivisions and subdivided lands are located adjacent to these roads and the Pinedale South Road is most easily accessed using residential streets through the Town of Pinedale. The areas along these roads near and west of the New Fork River are used by local residents for recreation (i.e., walking, jogging, bicycling, etc.). Significant project-related traffic would adversely affect existing uses along these roads, including residential land uses.

Significant impacts are expected from accelerated deterioration of county road surfaces. Many of the roads in the PAPA were not designed for the loads they currently support. Increased levels of development traffic would result in further and accelerated deterioration of these roads.

4.5.3 Alternative Impacts

4.5.3.1 Summary of Impacts Common to All Alternatives (Except the No Action Exploration/Development Scenario). Potential impacts from all of the alternatives, except the No Action Exploration/Development Scenario, could include the following:

- increased traffic volume on area highways and roads;
- accelerated deterioration of road surfaces;
- increased road maintenance requirements because of increased traffic;
- increased off-road vehicle use, use of two-tracks and access to sensitive areas;
- increased likelihood of traffic accidents, vehicle-person and vehicle-animal collisions;
- increased access to sensitive areas during winter months while big game is abundant and potentially stressed; and
- increased speeding.

Transportation Planning in the Project Area.

It is not possible, at this time, to prepare a detailed Transportation Plan for the project because additional exploration is necessary to identify where development could be extensive in the 308 square mile project area. A transportation committee would be formed to address planning issues associated with development of a Transportation Plan for the PAPA. The first transportation meeting to discuss the concept of the committee was held during the August 6, 1999 workshop in Pinedale. The committee would be open to participation by all interested parties, including the BLM, operators, State of Wyoming, Sublette County, Mesa users, environmental groups, etc. The purpose of the transportation committee is to develop a framework that will allow the design, construction and operation of a transportation network in the PAPA that would provide reasonable access to areas with recoverable reserves and protect existing uses while minimizing, to the extent practicable, impacts to the environment and resource conflicts. The framework which will be used to develop the Transportation Plan for the PAPA is contained in Appendix B.

BLM will initiate an updated transportation planning process annually (see Appendix B). The purpose of this annual planning process is to examine each operator's annual transportation requirements as well as the need to protect sensitive resources in the project area (i.e., visual resources, big game habitats, sage grouse habitat, steep slopes, wetlands and streams, etc.). Pipelines would also be addressed in the annual transportation planning process.

The annual transportation planning process would determine the placement of new and/or upgraded

roads. Design parameters for the three types of roads proposed for the project on Federal lands (i.e., collector, local and resource roads) are provided on Table 2-4 and are in compliance with BLM's 9113 Manual specifications. On state and private lands, road routing would be specified by the landowner and operator. Development conflicts on Federal lands and minerals would be resolved by applying appropriate mitigation measures specified throughout this EIS or developed during the annual transportation planning process. Measures may include graveling and maintenance of roads; watering roads to minimize fugitive dust; limiting new road construction by routing proposed access roads with existing two-tracks to minimize road densities; directing traffic away from unsuitable or unneeded roads; and closing/reclaiming unneeded roads.

In compliance with BLM's 9113 Manual, roads would be designed to an appropriate standard and no higher than necessary to accommodate their intended functions. The transportation planning process would further minimize road development in the project area by using the existing road network, including two-tracks, whenever feasible. Two-tracks that cannot be used or upgraded because the alignment is in a poor location (drainage bottom, steep slopes, etc.) may be reclaimed (following a cultural survey) if a new road duplicates the two-track and the road is not needed by other resource users. The transportation planning process would insure that proposed pipelines are routed adjacent to one side of existing or proposed roads to the extent possible to minimize disturbance and to reduce additional transportation corridors. The road network designed during the transportation planning process would strive to minimize new access points to the Mesa and to limit the number of approaches from U.S. Highway 191 and State Highway 351 and coordinate with cattle trailing needs. Any new approaches to the highways would be rigorously reviewed and coordinated with the Wyoming Department of Transportation.

During project scoping, one issue raised was that roads and pipelines avoid steep slopes, the Lander Trail, streams and wetlands, and other sensitive resources. On Federal lands and minerals, standard stipulations apply to these situations, described in Chapter 2 (see Figure 2-5). Potential well pad locations in the PAPA on Federal lands and minerals already avoid these areas (see Section 2.5.5 and Appendix A). Impacts to these areas would be

minimized by locating roads and pipelines that avoid them as much as possible during transportation planning.

Another issue raised during scoping was that access by the public to new roads in the project area be controlled by gates or seasonal restrictions to minimize impacts to wildlife, livestock, and other sensitive areas or resources. According to the BLM's 9113 Manual, BLM roads are for use, development, protection and administration of public lands and resources. Though they are administered by a public agency, and generally open to use by the general public, they are not public roads. Although public use is generally allowed, roads may be closed or use-restricted to fulfill management objectives such as the protection of public health and safety or preservation of resources.

During scoping, concerns were raised about the potential for roads to cause erosion, slumping and increased sedimentation to the Green and New Fork rivers. These concerns are justifiable because vegetation clearing and excavation to construct roads exposes soils and loosens soil structure which increases susceptibility to erosion. Removal of vegetation also increases runoff and erosion by reducing interception from vegetation cover. Furthermore, during road construction, soils are compacted and grades and drainage systems can be changed or altered. These changes can increase erosion by redirecting the natural drainage patterns which may increase runoff and runoff velocity as well as concentrate flow volumes. Project-related activities that result in erosion would increase the potential for impacts to water quality in the Green and New Fork rivers if eroded sediments are transported to these waters.

Research indicates that slopes greater than 55 percent tend towards instability and the chance of mass failure (Levinski, 1982). Debris movement is likely to develop suddenly in bedded sediments or on shallow, relatively coarse-textured, cohesionless soils on steep hillsides. They are characterized by rapid downslope movement of fractured rock, soil and organic material along a slip surface roughly parallel to the topographic surface. Rotational slumps, earthflows or soil creep are likely to proceed in deep, saturated, fine textured soils on more moderate slopes and normally extend over a smaller area. Slumps and earthflows are relatively fast moving but

are often preceded by soil creep. Soil creep may be on the order of less than one foot per decade, however, stresses in potential slumps may build to the extent that even moderate rainfall may trigger an earthflow (Levinski, 1982). Review of available soil surveys (ERO Resource Corporation, 1988) as well as field verification surveys and aerial photo interpretation in the PAPA did not identify any soils or landforms (hummocky terrain or head scarps) that have slumped or appear to be susceptible to slumping. Therefore, with proper road alignments (which avoid steep slopes) and standard road designs (that provide a structurally stable road), the potential for increased slumping in the PAPA from the project alternatives should not be significant.

The potential for increased erosion caused by roads would be greatly reduced by implementation of the BLM's Mitigation Guidelines which avoids development on slopes greater than 25 percent (see Appendix A, Part I). Transport of sediment to area waters would be reduced by avoiding well pad locations within 500 feet of perennial streams and riparian areas, wetlands and within 100 feet of intermittent streams on Federal lands and minerals. Most sediment delivered to area waters would be from stream channel erosion following infrequent, high-intensity thunderstorms as opposed to soil erosion away from channels. Limiting development near streams will minimize potential sedimentation in area waters. If it is not possible to comply with these guidelines, detailed site-specific plans would be required showing how impacts would be mitigated or avoided.

In addition, all roads on Federal lands must be designed by or under the direction of a licensed professional engineer knowledgeable about highway engineering principles and procedures. This engineer is also responsible for assuring that roads meet the design criteria and are constructed to BLM standards. Standard road design practices which minimize erosion and sedimentation include fitting road alignments to terrain which will minimize earthwork and reduce the need for or shortening cut and fill slopes. According to Burroughs and King (1989), 75 percent of the sediment produced from roads (i.e., fill slopes, ditches and cut slopes) comes from cut and fill slopes. Where cut and fill slopes are necessary, they would be designed to minimize erosion and maximize revegetation potential by using recommended slopes based on the terrain and the height of the cut or fill.

Forbs and shrubs would be planted to stabilize slopes. Other slope treatments may include serrating slopes or applying topsoil, mulch or erosion control fabrics, where warranted.

Road surfacing requirements would be specified in the road design. The need for graveling roads would be based on soil characteristics, traffic loads and the potential for erosion or resource damage. According to the research of Burroughs and King (1989), sediment production from a road surface rutted by heavy truck traffic can increase by a factor of about two compared to the yield from a smooth road surface. All roads upgraded or developed for this project would be designed, constructed and surfaced to provide all-weather access. A standard below the resource road classification would only be allowed for short duration (30 to 60 days) and would not service traffic during the winter and spring months. Operators would assume risk of denied access to sites during inclement weather on roads that become impassible.

BLM road standards require that road plans would insure proper design and construction of structures that drain water from or through roads. These structures are critical to minimizing maintenance and adverse environmental effects from erosion and sediment action. The design (i.e., location, spacing, size, etc.) of ditches, culverts, drainage dips and fords would be based on site-specific topography and soil conditions, standard hydrologic and hydraulic principles, and the specification provided in BLM's 9113 Manual. Ditches would be designed and maintained so that they drain water off of and away from the road without clogging. The design would also assure that the ditches do not erode by using recommended gradients based on topography and soil properties. Rip-rap would be used in ditches where the potential for erosion exists. The road grade and culvert size would be balanced to avoid damage from a 25-year flood. Eighteen-inch diameter culverts would be the minimum used on Federal lands in the PAPA to facilitate cleaning. Where necessary, the inlet and outlet of culverts would be armored with rip-rap to minimize erosion and maintenance.

During scoping it was indicated that county roads in the project area are already being significantly impacted from low levels of drilling. These impacts include dust, washboards and a concern for safety. The county has expressed concern that some of their

roads in the project area are not designed for the traffic volumes and loads they are currently receiving. Consequently, these roads require continual maintenance. Existing aggregate surfaces on some of these roads do not have enough fines to bind the aggregate together. This increases maintenance requirements, dust and costs. Road bases in some areas are not adequate to support the heavy loads they are receiving and some road alignments may not be safe, especially in the winter.

Based on the projected level of traffic associated with this alternative, significant impacts would occur to county roads in the project area. The SS Alternative traffic level would significantly accelerate the deterioration of roads, increase fugitive dust and could create safety hazards.

Proposed Road Improvements. During the August, 1999 transportation workshop a number of problems were pointed out regarding current access to the PAPA. These included dust at residences adjacent to the Paradise Road and Green River Road, excessive speeds, washboarding, safety, traffic on Twin Bridges Road through the Town of Pinedale (it was suggested that a traffic study be conducted to determine future conflicts with accessing the project area through Pinedale), conflicts with big game winter ranges adjacent to the Mesa Road, and the need for adequate and safe turnouts from U.S. Highway 191 and State Highway 351 to intersecting BLM and county roads. Locations where these turnouts may be needed are shown on Figure 2-2.

To address these issues, it was suggested that a new road be constructed along the crest of the anticline. For this EIS, that proposed road is called the Anticline Crest Road, shown on Figure 2-2. The route would follow an existing pipeline corridor between the Mesa Road on the northern part of the PAPA and the north end of the Jonah North Road which currently terminates south of the New Fork River. A new bridge would need to be constructed across the New Fork River on private lands and therefore, an easement, obtained by the operator(s), would be required from the landowner. It was also suggested that a new road be installed to allow access from U.S. Highway 191 on the west side of Pinedale to the northern portion of the project area and the area southwest of Pinedale. For this EIS, this new road is called the Industrial Park Road, shown on Figure 2-2. The Project Wide and Anticline Crest

exploration/development scenarios addressed in this EIS assume the Anticline Crest Road and Industrial Park Road are constructed at some point in the future.

The Anticline Crest Road may solve a number of problems: development of this road would reduce traffic on the Green River Road and Paradise Road, thereby reducing safety, dust and road deterioration concerns. The road would also provide access to the Mesa from the south which would allow access in the winter without crossing deer winter ranges. The Industrial Park Road would allow access to the northern part of the Mesa without the need for traffic to travel through residential portions of Pinedale on the Twin Bridges Road. Currently, traffic avoids Twin Bridges Road by traveling on U.S. Highway 191 through Pinedale, turning south on the Green River Road and traveling back to the east on the Mesa Road. However, in the winter the Mesa Road is closed to protect deer winter range and all access would be routed on the Twin Bridges Road through town. The Industrial Park Road is an existing road to the county's sanitary transfer site as well as to the industrial park, utilizing this road would minimize the access points into the Mesa and from U.S. Highway 191.

Seasonal restrictions (from November 15 through April 30) are currently imposed by the Pinedale RMP on the Mesa in the northern part of the PAPA and around the New Fork River, to protect deer and antelope during winter. Although this restriction would apply to drilling and construction activities, it would not apply to operations-related traffic necessary for monitoring of producing wells and hauling of water and condensate. Currently, snow removal is not allowed on the Mesa Road near Pinedale and the road is closed to traffic once snow depths prevent its use. However, as development continues, wells in this area and throughout the winter ranges shown on Figures 3-19 and 3-20 would need to have winter access. Roads that are slated for winter snow removal will be designed so that snow removal will not cause damage and increase erosion.

Compression. Operators would use existing roads, where possible, to access new compressor station sites. All of the proposed sites are located next to existing utility corridors and therefore, it is not expected that construction and operation of a

compressor station at any of the sites would impact transportation.

Sales Pipeline. Construction and operation of the sales pipelines are not expected to result in significant adverse impacts to transportation. Most of the impacts would be temporary (i.e., occurring only during one construction season).

BP Amoco Field Office. The BP Amoco Field Office would be located on the Luman Road which provides the main access to the Jonah II Field. There is a turnout on U.S. Highway 191 at the intersection of the Luman Road. The Luman Road is considered a BLM collector road, therefore, construction of this office is not expected to cause any traffic related impacts.

4.5.3.2 Project Wide Exploration/Development Scenario

Under this development scenario project activities and potential transportation impacts could ultimately occur throughout the 308 square mile project area. Transportation planning for this development scenario would need to address the entire project area and the potential resource conflict that may arise. Appendix B provides the framework for the transportation planning process that would be conducted for project development.

Standard Stipulations Alternative. Peak transportation requirements associated with a single well are shown on Table 4-11. This table also provides estimates for peak daily traffic for both the 500 and 700 well development levels. The peak daily traffic for both levels of development are assumed to be the same since both of these development levels could potentially have the same level of activities going on in the project area. A peak daily number of 110 heavy vehicle round trips and 190 light vehicle round trips (total of 300) is calculated for these levels of development for this alternative assuming that two locations are being built, eight wells are being drilled, two wells are being fractured and two wells are in the testing/completion stage.

Average daily traffic on U.S. Highway 191 ranges from 1,170 vehicles per day near Eden to 1,970 vehicles per day near Pinedale. Near the junction with State Highway 351, the average daily traffic is 1,330 vehicles per day (Wyoming Department of

Transportation, 1998). The peak daily traffic associated with eight rigs working simultaneously in the PAPA (in addition to other activities) would be 600 one-way trips. Assuming all of the project-related traffic uses U.S. Highway 191, this level of project-related traffic would represent an approximate increase of 30 to 45 percent in daily traffic volume. Although this increase seems relatively high, it is not expected to decrease the level of service on U.S. Highway 191 or produce significant impacts considering this traffic is occurring over a 24-hour period. Generally, peak workforce traffic for the project would not overlap with primary travel times of vacationers on U.S. Highway 191 or State Highway 351, except for possibly one drilling shift change in the afternoon. The traffic increase is not expected to have an impact on tourism in Pinedale, because most workforce traffic is expected to come from the Rock Springs and Big Piney/Marbleton areas with workers returning to these towns daily. It may be attractive to workers to stay in Pinedale in the winter. However, this would not overlap periods of high tourist traffic which occurs in the summer.

Average daily traffic on State Highway 351 during 1997 was 445 vehicles per day between U.S. Highway 189 and Paradise Road and was 280 vehicles per day between Paradise Road and U.S. Highway 191. The peak daily traffic associated with eight rigs and associated activities working simultaneously in the PAPA would be 600 one-way trips. Again, assuming all of the project-related traffic uses U.S. Highway 191, and subsequently State Highway 351 between U.S. Highway 191 and Paradise Road, this level of project-related traffic would double the current daily traffic volume on State Highway 351. However, this increase is not expected to produce significant impacts considering this traffic is spread out over a 24 hour period and State Highway 351 is a paved road in good condition which should be able to easily absorb the increased traffic. Before U.S. Highway 191 was complete, State Highway 351, between U.S. Highway 189 and Paradise Road, experienced average daily traffic levels of 1,239 vehicles in 1958.

RP Alternatives. The RP Alternatives would decrease peak traffic requirements for the project. The peak number of rigs working in the PAPA under this alternative would be limited to five. Table 4-12 presents peak traffic associated with these

Activity	Single Well Heavy Vehicles Daily Round Trips	Single Well Light Vehicles Daily Round Trips	Peak Traffic Heavy Vehicles Daily Round Trips	Peak Traffic Light Vehicles Daily Round Trips
Location construction (includes drilling water well)	2	8	4	16
Drilling	5	15	40	120
Fracturing	25	17	50	34
Well completion and testing (includes gas gathering line)	8	10	16	20
Total			110	190

Activity	Single Well Heavy Vehicles Daily Round Trips	Single Well Light Vehicles Daily Round Trips	Peak Traffic Heavy Vehicles Daily Round Trips	Peak Traffic Light Vehicles Daily Round Trips
Location construction (includes drilling water well)	2	8	2	8
Drilling	5	15	25	45
Fracturing	25	17	25	17
Well completion and testing (includes gas gathering line)	8	10	8	10
Total			60	80

alternatives. As with the SS Alternative, it is assumed that peak traffic could potentially be the same for the 500 and 700 well development levels. This assumption is based on the potential that both of these levels of development could have the same level of activities going on in the project area during development.

Peak traffic for these alternatives would be associated with five rigs drilling, one pad being constructed, one well being fractured and one well being tested/completed. Using these assumptions and assuming peak traffic for each activity is present simultaneously, up to 60 heavy and 80 light vehicle daily round trips (140 round trips total) could be associated with the project on any given day.

Assuming all of the project-related traffic uses U.S. Highway 191, this level of traffic would represent an approximate 14 to 24 percent increase in daily traffic volume. This traffic level is not expected to decrease the level of service on U.S. Highway 191 or produce significant impacts considering this traffic would be spread out over a 24 hour period.

If all of the peak daily one-way trips enter the PAPA on State Highway 351 from U.S. Highway 191,

daily traffic on State Highway 351 would double. However, it is not expected that this increase in traffic would cause a decrease in level of service of this highway.

Pad Drilling. Pad drilling may slightly decrease traffic levels in the project area because one well pad would be utilized to drill multiple wells. Therefore, construction traffic required to build other well pads would not be required where pad drilling is implemented. This reduction in traffic is expected to be minor because traffic associated with construction of pad locations represents a minor component of the daily peak traffic. For example, according to Table 4-12 this traffic represents 10 daily round trips (i.e., 2 heavy vehicles round trips and 8 light vehicles round trips) compared to total 140 daily round trips for all project activities. Pad drilling would also reduce the number of well pads per/section which would minimize the number of roads that would need to be constructed in areas where pad drilling is implemented.

Centralized Production Facilities. These facilities would not reduce traffic levels during the development period because the number of well pads, roads and pipelines would not be reduced. However, in the

long-term during operations these facilities would reduce traffic in the project area since not all of the well pad locations would need to be visited on a daily basis. This would reduce both heavy and light-duty traffic levels in the project area because pumpers in pickups would not need to visit all of the well pads in a section (i.e., up to 16 well pads/section) on a daily basis and trucks hauling water and condensate would only need to haul fluids from 1 or 2 centralized production facilities in each section.

4.5.3.3 Anticline Crest Exploration/Development Scenario. Under this development scenario the proposed Anticline Crest and Industrial Park roads described in Section 4.5.3.1, if built, could provide the main access routes to the anticline crest. These roads would provide the principle transportation network along the spine of the anticline crest area where development would be concentrated. These roads should reduce the need for other access points into the Mesa. In addition, these roads should significantly reduce traffic levels in the project area on the Green River Road, Boulder South Road, Paradise Road and Pinedale South Road compared to the Project Wide Scenario. The reduction in traffic levels on these roads would also prevent significant impacts (dust, safety, road deterioration, etc.) to residents living along these roads. In addition, this development scenario should minimize transportation conflicts with other resources in the PAPA (i.e., wildlife, livestock operations and trailing and recreation, etc.) because development would not be as extensive as the Project Wide Scenario.

Standard Stipulations Alternative. This alternative would have the same peak traffic levels and impacts to state highways as described for the SS Alternative under the Project Wide Scenario. Peak traffic levels are provided in Table 4-11.

RP Alternatives. This alternative would have the same peak traffic levels and impacts to state highways as explained for this alternative for the Project Wide Scenario. Peak traffic levels are provided on Tables 4-12.

4.5.3.4 No Action Exploration/Development Scenario. Implementation of the No Action Exploration/Development Scenario would eliminate the need to construct additional roads in the PAPA.

Additional traffic on U.S. Highway 191 and State Highway 351 would not occur.

4.5.4 Additional Mitigation Opportunities.

There are several mitigation measures which should be implemented to further reduce impacts to transportation. The BLM cannot impose mitigation measures 4, 5, 6, and 7 listed below - their adoption could be required by other governmental entities or volunteered by the operators.

Transportation Mitigation Opportunity 1. Consider routing pipelines adjacent to one side of existing or proposed roads to minimize disturbance and to reduce additional corridors.

Transportation Mitigation Opportunity 2. Where deemed necessary, locked gates should be installed on oil field roads (with structures added to prevent drive-arounds) to reduce traffic and protect other resources (e.g., wildlife, cultural resources, etc.) from impacts described elsewhere in this EIS. The need and location of locked gates would be determined during the transportation planning process.

Transportation Mitigation Opportunity 3. The operators should be responsible for preventive and corrective maintenance of all roads in the PAPA throughout the duration of the project. This may include blading, cleaning ditches and culverts, dust abatement, maintenance of cattleguards, fences, drainages structures, noxious weed control, or other requirements.

Transportation Mitigation Opportunity 4. All project-related traffic should avoid using the Pinedale South Road (Tyler Avenue) through the Town of Pinedale. This restriction should apply to light vehicle and heavy truck traffic.

Transportation Mitigation Opportunity 5. The operators could encourage ride sharing to reduce traffic levels.

Transportation Mitigation Opportunity 6. The operators should work with Sublette County to develop maintenance agreements for county roads in the PAPA. Maintenance agreements should address the need to upgrade or surface these roads to minimize dust and road deterioration impacts (washboards). The county has specified that paving

is not an option on any of their roads, but the use of gravel (meeting county specifications) and other binding products could be considered.

Transportation Mitigation Opportunity 7.

Speeding is a serious issue in the project area. Speed limits should be posted on county roads as well as on BLM collector and local roads. To minimize speeding and associated impacts, the operators and their contractors should develop a program to encourage workers to obey posted speeds. If this fails, the operators may need to encourage the county sheriff to patrol county roads in the PAPA.

Transportation Mitigation Opportunity 8. New road alignments should avoid rare plant habitats wherever possible.

4.6 Land Use/Residential Areas

4.6.1 Scoping Issues. Many comments were received concerning potential impacts to land use, particularly in residential areas. These concerns are summarized below:

1. Concerned about impacts to private lands when the landowner doesn't own the mineral estate.
2. Limit impacts close to town.
3. What will happen in residential areas when they are face-to-face with a fully developed industrial site?
4. What can be done to encourage companies to conduct themselves as good corporate citizens on private lands?
5. Adopt Federal land protections on private lands.
6. Concerned that BLM gives more consideration to sage grouse leks than it does to the residents of Pinedale.
7. Concerned about wells being less than a quarter mile from homes.
8. Equipment should be stored in designated industrial areas and away from main traffic areas.
9. Implement a five-mile restrictive, no drilling buffer zone around Pinedale.
10. Maintain openness of the area - balance development with open space.
11. What effect will development have on property values?

4.6.2 Significance Criteria. Significant impacts to land use would result from project-related activities if those activities:

- are incompatible with land use ordinances, plans, regulations or controls;
- adversely affect other existing and legitimate land uses; or
- adversely affect the use, enjoyment or value of adjacent property or introduce safety and health risks or a nuisance or annoyance to an area where such risks, nuisance, or annoyance did not previously exist.

Significant impacts to land use are expected from all of the alternatives except the No Action Exploration/Development Scenario. It is important to recognize that the proposed development does not conform to the Pinedale RMP level of foreseeable oil and gas development. As such, this EIS will update the analysis of the Pinedale RMP (see Chapter 5). In addition, extensive development on many of the private parcels of land in the project area would not be compatible with their current zoned use as established by the Sublette County Zoning and Development regulations. Conflicts may occur between drilling and operational activities and residential uses.

Many of the impacts to land uses are discussed in other sections of this chapter (i.e., recreation resources, grazing, etc.). This section will focus on general landscape and open space impacts and impacts to residential land uses.

The management objectives for the Residential Areas SRMZ differ for each of the alternatives. These differences are summarized on Table 2-8 and are described below:

Standard Stipulations Alternative. Consistent with current BLM Mitigation Guidelines placement of well pads on Federal lands and minerals within 0.25 miles of occupied dwellings would be avoided. On private and state lands and minerals, well pads could be placed as close as 350 feet from occupied dwellings.

RP Alternative on Federal Lands and Minerals. This applies the same BLM Mitigation Guideline as the SS Alternative, except BLM would expand the 0.25 mile buffer to include areas zoned for residential use by Sublette County and subdivisions and subdivided lands. This would avoid placement of well pads within the entire Residential Areas SRMZ (see Figure 3-7) on Federal lands and minerals.

RP Alternative on All Lands and Minerals. No well pads would be located within any portion of the Residential Areas SRMZ.

4.6.3 Alternative Impacts

4.6.3.1 Summary of Impacts Common to All Alternatives (Except the No Action Exploration/Development Scenario). If development occurs, land use in the project area will change. Although exploration represents only a minor, temporary impact to current land uses, under a full development scenario, oil and gas activities would become the dominant land use and may preclude or interfere with other land uses.

Open space and solitude best describe the feeling one gets when traveling through most of the project area. Some of the area is inaccessible by vehicles and when one walks away from one of the few roads in the area, it is difficult to find evidence of human activity. The views from most of the project area, particularly the Mesa, are exceptional. To the east is the celebrated Wind River Range and to the west the Wyoming Range.

While the views are equally as dramatic in the Jonah II Field, the sense of openness and solitude have been lost. In that portion of the Jonah II Field currently being developed, one is constantly aware that extensive development activities are ongoing. This is not a criticism of oil and gas development but rather a recognition of the difference in the feeling of open space and solitude between the two areas. Because it is impossible to predict where economically recoverable quantities of oil and gas occur in the PAPA, it is not possible to predict where the changes in open space and solitude will occur. But, wherever development does occur, these characteristics of the landscape will be lost. These impacts to open space and solitude are, to some extent, dependent on well density. Obviously, the less wells per section the less the visual impairment and road density. However, even at a well density of 4 surface locations per square mile, the feeling of open space and solitude would be significantly reduced. Additional impacts that could affect the setting include trash that blows off location, material and equipment that is left behind after the completion operations, and flagging and staking.

Residential Areas and Subdivisions. As stated in Chapter 3, approximately 1,530 acres in the PAPA have been subdivided for residential development. The potential impact to these subdivisions is discussed for each of the development levels and alternatives below.

Impacts from lights. At night the drilling rigs use a number of lights to illuminate work areas. These lights are necessary for safe operations. Such lights would be noticeable at adjacent residences and at a number of locations in the Pinedale area. Some will find these lights intrusive. However, the impacts are short-term (around a few months). During operations, lights would not be used at the well pads routinely.

Impacts from noise. Noise may represent a significant nuisance when drilling occurs in close proximity to an occupied dwelling. Fortunately, the impact from drilling and completion noise should be relatively short-lived (less than 2 months). Noise measurements were taken in the summer of 1998 at an operating rig in the Jonah II Field. Noise levels from the drilling rig would decrease with distance away from the rig as provided below:

<u>Feet From Rig</u>	<u>Noise Level (dBA)</u>
100	68.8
200	62.7
500	54.0
1,000	47.2
2,000	39.4
3,000	34.1
5,000	26.0
10,000	11.0

Impacts from odor. Hydrocarbon odors flashed from the tanks and production equipment could be noticeable under certain atmospheric conditions. It is expected, based on data provided by Ultra, that wells in the PAPA may emit quantities of VOCs and HAPs for the first few years of production (see Section 2.5.5). The VOCs emitted from these facilities have a distinct hydrocarbon odor. During certain atmospheric conditions, production facilities may violate Sublette County's odor standard. That standard states that "*no use shall be permitted in any district which results in the discharge of unreasonable or objectionable odors beyond the boundaries of the site.*" It is expected that during the first few years of production, when gas and condensate volumes are at their highest, odor from VOCs will be noticeable during certain atmospheric conditions at residences located 350 feet from the production facilities. Odor

from diesel engines at drill sites would also likely be noticeable at these residences.

In Chapter 3, nighttime noise level in the project area was estimated to be approximately 32 dBA. Daytime background noise level was estimated at 39 dBA. Noise from a drilling rig would be discernable at about 2,000 feet during the daytime, whereas at nighttime noise from the rig would be discernable to about 3,500 feet. EPA (1974) has identified a nighttime average sound level of 35 dBA to protect against sleep interference. This noise level could be exceeded at night to a distance of 2,500 feet from a drilling rig. However, the noise would be most perceptible during the summer months when most adjacent residents sleep with open windows.

According to the National Institute on Deafness and Other Communication Disorders, normal conversation has a noise level of about 65 dBA. A snowmobile is about 105 and a lawnmower is 85 to 90 dBA.

Noise is one of the most common forms of sleep disturbance. Noise can cause the sleeper to awaken periodically but can also produce reactions of which the individual is unaware. These reactions can include changes from heavier to lighter stages of sleep, reductions in rapid eye movement sleep, increased body movement at night, changes in cardiovascular responses, and mood changes. If drilling occurs during the summer months within 350 feet of occupied dwellings, it is reasonable to conclude that drilling activities could result in sleep disturbance for adjacent residents. How many adjacent residences would be affected would depend on a number of factors including their distance from the drilling activity, terrain, vegetation and other factors that could decrease the intensity of noise from the drilling rig.

Sublette County Zoning and Development regulations address noise. In residential zoned districts *"no use shall be operated so that noise resulting from said use is perceptible beyond the boundaries of the property on which said use is located."* Noise from temporary construction equipment is exempt from this development standard and it can be reasonably argued that drilling of a well would qualify for this exemption. Noise from production equipment is not expected to exceed Sublette County noise regulations.

Increased traffic on subdivision roads. Based on the street layout of certain subdivisions in the project area, it is reasonable to conclude that traffic associated with drilling of certain wells within subdivisions would travel on subdivision roads. Traffic that occurs during shift changes at night, when there is usually no traffic through these residential areas, would be particularly disruptive.

Safety. Residents adjacent to drilling and producing sites would be asked to accept safety risks that previously did not exist. Extra precautions by the operators would be necessary to prevent children and pets from wandering onto the drilling (approximately 2 months) or producing location. However slight the possibility, a blowout from a well could occur. Such a blowout would likely necessitate evacuation of the area.

Reduction in property values. Although it is impossible to quantify, drilling of wells and the installation of production facilities over the next 10 to 15 years would likely reduce the value of property adjacent to these activities. It is likely that unsold lots would be less attractive than those outside the project area. Unlike other parts of the western United States, people moving to the Pinedale area may not be familiar with oil and gas activities and may choose to reside where drilling and production facilities are not prevalent. The demand for housing in areas with extensive oil and gas development would be expected to decrease.

When all the various types of impacts are considered, it was concluded that oil and gas development in the Residential Areas SRMZ would have a significant adverse impact on residents of the area.

Compression. All of the compressor station locations shown of Figure 2-10 are located in the shrub and brush rangeland land use/land cover type, except the site proposed by Western Gas in Section 34, T. 29 N., R. 108 W. This site is located at an existing compressor station site operated by Western Gas in the Jonah II Field. Construction of the compressor stations within the shrub and brush type would change the existing land use to an industrial setting in the long-term. Approximately 7 acres of the existing land use would be converted to industrial use, however, impacts to land use would be minimized because all of the proposed sites (except

Ultra's which is located about 1.5 miles east of the existing pipeline corridor) are located within an existing utility corridor and are adjacent to existing roads. All of the proposed sites are located within the Resource Conservation zones of Sublette County, except the site proposed by Jonah Gas in Section 3, T. 31 N., R. 109 W. and Ultra's proposed site located in Section 16 T. 31 N., R. 108 W. These are within the Sublette County Agricultural Zone. All of the proposed compressor station sites are located outside of the Residential SRMZ. The site proposed by Jonah Gas, located in Section 3, T. 31 N., R. 109 W., is the closest to the SRMZ at about 0.8 miles.

Sales Pipeline. Because the sales pipeline would be buried and constructed entirely within an existing utility corridor, there would not be a long-term impact to land use.

BP Amoco Field Office. This field office would be located on Federal lands and minerals and would not impact any areas within the Residential SRMZ. This office would be located on the Luman Road which is the main access into the Jonah II Field. Construction of this office would not impact land use because the traffic levels on the Luman Road have eliminated the open setting of the area adjacent to the road.

4.6.3.2 Project Wide Exploration/Development Scenario

Standard Stipulations Alternative. Under this scenario, the 500 and 700 well development levels would have the same potential to impact land uses and the Residential Areas SRMZ for all of the alternatives. However, the 700 well development level would be more likely to cause impacts than the 500 well level because the 200 additional wells and associated roads and pipelines could affect more residences.

As stated in Chapter 3, approximately 1,530 acres in the PAPA have been subdivided for residential development. Table 4-13 lists the subdivisions and subdivided lands in the PAPA and the number of potential well pad locations within each of the subdivisions. In addition, approximately 2,085 acres of the project area has been zoned for some level of residential use (see Table 4-14). Definitions of each of the zoning districts are provided in Chapter 3. Under the SS Alternative, lands currently zoned as

residential by Sublette County would be subject to drilling and operation activities. Table 4-14 lists the number of potential well pad locations in each of the residential zones in the project area.

To a limited extent, the WOGCC regulates drilling and production activities in close proximity to residences. The WOGCC generally prohibits the placement of a reserve pit closer than 350 feet from residences. In addition, the WOGCC rules require the operators to *"locate production tanks and/or associated production equipment no less than three hundred fifty feet (350') from any residences, schools, hospitals, or other places where people are known to congregate.* Therefore, under this alternative, wells could be drilled as close as 350 feet from occupied dwellings on private and state lands and minerals.

RP Alternative on Federal Lands and Minerals. BLM has adopted measures on Federal lands and minerals to protect adjacent residences. For the SS Alternative, BLM would avoid placement of well pads on Federal lands and minerals within 0.25 miles of occupied dwellings. Where possible, these well pads would be relocated outside the buffer area and the well would be directionally drilled to the desired bottomhole. In some cases, however, the well pad could be eliminated altogether because of other surface constraints. Table 4-15 lists the 35 potential well pad locations on Federal lands and minerals affected by the 0.25 mile occupied dwelling mitigation guideline. BLM's Mitigation Guidelines would reduce impacts to several residences located adjacent to Federal lands and minerals. However, the majority of the residences in the project area are located on private lands and minerals away from Federal lands and the mitigation guideline would not reduce impact in these areas.

Sublette County's Zoning and Development Regulations allow mining and mineral extraction in any zone. However, oil and gas activities are specifically excluded from the definition of mining and mineral extraction. Section 3 of the County's regulations lists the uses which are authorized in the development zones. For the rural residential zones in the project area, the zoning regulations contemplate the use as single family dwellings and guest houses or cabins. Conditional uses include both public facilities and bed and breakfast. However, other than for oil field sales and services and the construction of a gas plant, the county zoning regulations do not

Table 4-13
Potential Well Pad Locations in and within 0.25 Miles of Subdivisions and Subdivided Lands in the Project Area

Subdivision Name	Type	Potential Well Pad Locations Within the Subdivision or Subdivided Lands	Potential Well Pad Locations Within 0.25 Miles of the Subdivision or Subdivided Lands
Wild Horse Ranch	Subdivision	4	14
Big Country Ranches Fourth Filing Unit C	Subdivision	1	3
Half Moon Mountain Fourth	Subdivision	0	2
Big Country Ranches Fourth Filing Unit A	Subdivision	0	2
Airport	Subdivision	3	13
Bridle Bit Ranches	Large Tract Development	1	14
Beck	Subdivision	0	6
Scenic View	Subdivision	1	6
Rocky Roads	Subdivision	0	3
South Forty	Subdivision	1	6
Thirty-three (33) Ranch	Subdivision	0	2
Redstone New Fork River	Subdivision	5	24
New Fork Social Club	Subdivision	8	25
Swingers Green 2nd	Subdivision	1	5
Bloom	Subdivision	1	6
Valley Hills	Subdivision	1	7
Giebel	Subdivision	1	5
Wind River Peaks	Subdivision	0	2
Burt	Lot Division	1	6
Agostini	Lot Division	1	9
Scout's View	Large Tract Development	4	12
Haymeadow	Lot Division	0	2
Willow	Lot Division	0	4
Tad/shaffer	Lot Division	1	4
Mullett	Lot Division	1	6
Merritt, Harold	Lot Division	1	5
New Fork Social Club Second	Lot Division	1	9
Allan	Lot Division	1	9
Orvie E. Berg	Lot Division	0	3
Hicks	Lot Division	0	4
Hopkins	Lot Division	0	2
Industrial Site	Subdivision	3	13
Total		42	233

Table 4-14
Potential Well Pad Locations in and within 0.25 Miles of Areas Zoned for Residential Use in the Project Area

Residential Zone	Total Acres in PAPA	Potential Well Pad Locations Within the Residential Zone	Potential Well Pad Locations Within 0.25 Miles of the Residential Zone
Rural residential	1392	30	85
Rural residential 10	366	11	75
Rural residential 20	166	4	31
Rural residential 5	127	5	20
Rural residential mobile/manufactured home 10	34	1	3
Total	2085	51	214

Table 4-15
Potential Well Pad Locations That Would be Eliminated or Relocated on Federal Lands and Minerals by Imposing a 0.25 Mile Protective Buffer Around Occupied Dwellings

Potential Well Pad Location	Legal Location	Federal Lease Number
8-1	Section 1, T. 33 N., R. 110 W.	WYW128254
16-1	Section 1, T. 33 N., R. 110 W.	WYW128254
1-12	Section 12, T. 33 N., R. 110 W.	WYW128255
2-12	Section 12, T. 33 N., R. 110 W.	WYW128255
8-12	Section 12, T. 33 N., R. 110 W.	WYW128255
5-6	Section 6, T. 33 N., R. 109 W.	WYW128176
9-6	Section 6, T. 33 N., R. 109 W.	WYW130234
14-6	Section 6, T. 33 N., R. 109 W.	WYW128176
11-5	Section 5, T. 33 N., R. 109 W.	WYW130234
12-5	Section 5, T. 33 N., R. 109 W.	WYW130234
15-5	Section 5, T. 33 N., R. 109 W.	WYW130234
1-8	Section 8, T. 33 N., R. 109 W.	WYW130234
8-8	Section 8, T. 33 N., R. 109 W.	WYW130234
5-9	Section 9, T. 33 N., R. 109 W.	WYW128176
12-9	Section 9, T. 33 N., R. 109 W.	WYW128176
8-31	Section 31, T. 32 N., R. 108 W.	WYW139396
12-32	Section 32, T. 32 N., R. 108 W.	WYW143661
5-1	Section 1, T. 31 N., R. 109 W.	WYW6270
6-1	Section 1, T. 31 N., R. 109 W.	WYW6270
12-1	Section 1, T. 31 N., R. 109 W.	WYW6270
9-2	Section 2, T. 31 N., R. 109 W.	WYW6270
3-10	Section 10, T. 31 N., R. 109 W.	WYW6270
5-10	Section 10, T. 31 N., R. 109 W.	WYW6270
13-10	Section 10, T. 31 N., R. 109 W.	WYW6270
16-9	Section 9, T. 31 N., R. 109 W.	WYW6270
5-22	Section 22, T. 31 N., R. 109 W.	WYW26025
12-22	Section 22, T. 31 N., R. 109 W.	WYW143046
3-21	Section 21, T. 31 N., R. 109 W.	WYW143046

Table 4-15 Concluded		
Potential Well Pad Location	Legal Location	Federal Lease Number
4-21	Section 21, T. 31 N., R. 109 W.	WYW143046
5-21	Section 21, T. 31 N., R. 109 W.	WYW143046
9-20	Section 20, T. 31 N., R. 109 W.	WYW125138
10-20	Section 20, T. 31 N., R. 109 W.	WYW125138
15-20	Section 20, T. 31 N., R. 109 W.	WYW125138
12-5	Section 5, T. 30 N., R. 109 W.	WYW124623
9-6	Section 6, T. 30 N., R. 109 W.	WYW115609

address development of individual oil and gas wells. In the past, the county has allowed a few wells to be drilled without requiring conditional use approval. However, because they are now facing more extensive development, the Sublette County Planning and Zoning Department is proposing to review the current zoning regulations and address drilling of oil and gas wells.

Extensive oil and gas development in residential areas could result in significant impacts to residents. This is because of the inability of regulatory agencies to prevent drilling and production activities within 350 feet from occupied dwellings on state and private lands and minerals. BLM requires that drilling and production activities be located no closer than 0.25 miles from occupied dwellings.

This alternative would avoid surface disturbance on Federal lands and minerals within 0.25 mile of residences, subdivisions or areas zoned for residential use. The 51 potential well pad locations listed on Table 4-16 would either be eliminated or relocated to outside the 0.25 mile buffer.

While this alternative would reduce some of the impact in the Residential Areas SRMZ, most of the impacts would persist because most of the lands and minerals in this SRMZ are non-Federal. Under this alternative, potential well pad locations would be avoided within the Residential Areas SRMZ on Federal lands and minerals. However, 196 potential well pad locations would remain in the SRMZ on private and state lands and minerals (see Table 2-8). The potential well pad locations on non-Federal lands and minerals within 0.25 miles of occupied dwellings, subdivisions or subdivided lands or areas zoned as residential by Sublette County are listed on Table 4-

17. Significant impacts to residents could still occur under this alternative.

Pad Drilling. Because this option would not be applied on non-Federal lands, under this alternative, it would do little to reduce potential impacts to the Residential SRMZ. On Federal lands and minerals pad drilling would reduce impacts to land uses by minimizing the number of wells, roads and pipelines per section in certain SRMZs. Potentially this could mean 4 pads per square mile as opposed to 16 pads per square mile.

Centralized Production Facilities. As with pad drilling, since this option would not be applied to private and state lands and minerals it would do little to minimize impacts to the Residential Areas SRMZ. Short-term impacts could be significant to the SRMZ since up to 16 well pads/section could be developed. On Federal lands and minerals this option should reduce impacts to some land uses, such as livestock operation and wildlife, in the long-term (after the development period). This reduction in long-term impacts would occur because traffic levels in the project area would be diminished. Centralized production facilities would eliminate the need for daily trips to each well pad location. Visits to the 1 or 2 centralized production facilities per section would still be where necessary to remove fluids by tanker trucks.

RP Alternative on All Lands and Minerals. Under this alternative, wells would not be drilled anywhere within the Residential Areas SRMZ. As such, the potential impacts described above in Section 4.6.3.1 would not occur. The 196 well pad locations listed on Table 4-17 would not be developed. This alternative could only be implemented through changes in Sublette County's

Table 4-16

Potential Well Pad Locations That Would be Eliminated or Relocated on Federal Lands and Minerals by Imposing a 0.25 Mile Protective Buffer Around Occupied Dwellings, Areas Zoned for Residential Use and Subdivisions and Subdivided Lands for the RP Alternative on Federal Lands and Minerals

Potential Well Pad Location	Legal Location	Federal Lease Number
2-1	Section 1, T. 33 N., R. 110 W.	WYW128254
7-1	Section 1, T. 33 N., R. 110 W.	WYW128254
8-1	Section 1, T. 33 N., R. 110 W.	WYW128254
9-1	Section 1, T. 33 N., R. 110 W.	WYW128254
15-1	Section 1, T. 33 N., R. 110 W.	WYW128254
16-1	Section 1, T. 33 N., R. 110 W.	WYW128254
1-12	Section 12, T. 33 N., R. 110 W.	WYW128255
2-12	Section 12, T. 33 N., R. 110 W.	WYW128255
8-12	Section 12, T. 33 N., R. 110 W.	WYW128255
5-6	Section 6, T. 33 N., R. 109 W.	WYW128176
9-6	Section 6, T. 33 N., R. 109 W.	WYW130234
10-6	Section 6, T. 33 N., R. 109 W.	WYW130234
12-6	Section 6, T. 33 N., R. 109 W.	WYW128176
14-6	Section 6, T. 33 N., R. 109 W.	WYW128176
3-7	Section 7, T. 33 N., R. 109 W.	WYW130234
11-5	Section 5, T. 33 N., R. 109 W.	WYW130234
12-5	Section 5, T. 33 N., R. 109 W.	WYW130234
14-5	Section 5, T. 33 N., R. 109 W.	WYW130234
15-5	Section 5, T. 33 N., R. 109 W.	WYW130234
1-8	Section 8, T. 33 N., R. 109 W.	WYW130234
2-8	Section 8, T. 33 N., R. 109 W.	WYW130234
8-8	Section 8, T. 33 N., R. 109 W.	WYW130234
5-9	Section 9, T. 33 N., R. 109 W.	WYW128176
12-9	Section 9, T. 33 N., R. 109 W.	WYW128176
13-9	Section 9, T. 33 N., R. 109 W.	WYW128176
1-13	Section 13, T. 33 N., R. 109 W.	WYW143664
3-13	Section 13, T. 33 N., R. 109 W.	WYW143664
8-13	Section 13, T. 33 N., R. 109 W.	WYW143664
12-32	Section 32, T. 32 N., R. 108 W.	WYW143661
10-31	Section 31, T. 32 N., R. 108 W.	WYW139396
5-1	Section 1, T. 31 N., R. 109 W.	WYW6270
6-1	Section 1, T. 31 N., R. 109 W.	WYW6270
12-1	Section 1, T. 31 N., R. 109 W.	WYW6270
8-2	Section 2, T. 31 N., R. 109 W.	WYW6270
3-10	Section 10, T. 31 N., R. 109 W.	WYW6270
5-10	Section 10, T. 31 N., R. 109 W.	WYW6270
13-10	Section 10, T. 31 N., R. 109 W.	WYW6270
16-9	Section 9, T. 31 N., R. 109 W.	WYW6270
5-22	Section 22, T. 31 N., R. 109 W.	WYW26025

Table 4-16 Concluded		
Potential Well Pad Location	Legal Location	Federal Lease Number
12-22	Section 22, T. 31 N., R. 109 W.	WYW143046
3-21	Section 21, T. 31 N., R. 109 W.	WYW143046
4-21	Section 21, T. 31 N., R. 109 W.	WYW143046
5-21	Section 21, T. 31 N., R. 109 W.	WYW143046
14-21	Section 21, T. 31 N., R. 109 W.	WYW140346
15-21	Section 21, T. 31 N., R. 109 W.	WYW140346
16-21	Section 21, T. 31 N., R. 109 W.	WYW140346
9-20	Section 20, T. 31 N., R. 109 W.	WYW125138
10-20	Section 20, T. 31 N., R. 109 W.	WYW125138
15-20	Section 20, T. 31 N., R. 109 W.	WYW125138
12-5	Section 5, T. 30 N., R. 109 W.	WYW124623
9-6	Section 6, T. 30 N., R. 109 W.	WYW115609

zoning ordinances or by voluntary measures from the operators.

Pad Drilling. Under this option, no pad drilling or other well drilling options would occur within the Residential Areas SRMZ and no impacts would occur within the SRMZ. Outside the Residential Areas SRMZ, pad drilling would reduce impacts to other land uses as described in the RP Alternative on Federal Lands and Minerals.

Centralized Production Facilities. As with other well drilling options, no drilling would occur within the Residential SRMZ, therefore, impacts to this SRMZ would be eliminated. Centralized production facilities should reduce impacts in the project area to other land uses (grazing, wildlife, etc.) in the long-term. Traffic would be reduced during operations by minimizing daily trips to each well location and by limiting the number of sites from which fluids (water and condensate) would be hauled to 1 or 2 per section.

4.6.3.3 Anticline Crest Exploration/Development Scenario. Development along the anticline crest would substantially reduce impacts to land uses in the PAPA because development would be concentrated along the crest of the anticline. Under this development scenario the changes in open space and solitude are not expected to occur throughout the PAPA and fewer areas of the Residential SRMZ would be impacted by development.

Standard Stipulations Alternative. As with the Project Wide Scenario, the 700 well development level would have a higher probability to cause potential land use impacts than the 500 well level because there would be 200 additional well pads and associated roads and pipelines. This applies to the SS Alternative as well as the other alternatives. Under the Anticline Crest Scenario there are approximately 185 acres that have been subdivided for residential development within 6 subdivisions. This development scenario would greatly reduce impacts to these areas compared to the Project Wide Scenario which could potentially impact 1,530 acres within 26 subdivisions. Table 4-18 lists the subdivisions and subdivided lands in the anticline crest area and the number of potential well pad locations within each of the subdivisions.

Development limited to the anticline crest would reduce the potential number of well pads located in subdivisions by 31 compared to the Project Wide Scenario and would reduce the number of well pad locations within 0.25 miles of subdivisions by 176 (compare Tables 4-14 and Table 4-18). In addition, approximately 85 acres of the project area has been zoned for some level of residential use (see Table 4-19). Under the SS Alternative, lands currently zoned as residential by Sublette County on the anticline crest would be subject to drilling and operation activities. Table 4-19 lists the number of potential well pad locations in each of the residential zones within the anticline crest.

Table 4-17 Number of Potential Well Pad Locations on Private and State Lands and Minerals and within the Residential Areas SRMZ	
Location	Number of Potential Well Pad Locations
Section 31, T. 34 N., R. 109 W.	2
Section 32, T. 34 N., R. 109 W.	6
Section 1, T. 33 N., R. 110 W.	1
Section 3, T. 33 N., R. 110 W.	2
Section 6, T. 33 N., R. 109 W.	7
Section 5, T. 33 N., R. 109 W.	11
Section 11, T. 33 N., R. 109 W.	16
Section 10, T. 33 N., R. 109 W.	16
Section 9, T. 33 N., R. 109 W.	13
Section 16, T. 33 N., R. 109 W.	4
Section 15, T. 33 N., R. 109 W.	5
Section 14, T. 33 N., R. 109 W.	8
Section 13, T. 33 N., R. 109 W.	5
Section 24, T. 33 N., R. 109 W.	15
Section 23, T. 33 N., R. 109 W.	9
Section 22, T. 33 N., R. 109 W.	5
Section 27, T. 33 N., R. 109 W.	1
Section 26, T. 33 N., R. 109 W.	9
Section 25, T. 33 N., R. 109 W.	12
Section 34, T. 33 N., R. 110 W.	2
Section 6, T. 32 N., R. 108 W.	3
Section 17, T. 32 N., R. 108 W.	2
Section 27, T. 32 N., R. 108 W.	2
Section 34, T. 32 N., R. 108 W.	4
Section 33, T. 32 N., R. 108 W.	3
Section 32, T. 32 N., R. 108 W.	3
Section 31, T. 32 N., R. 108 W.	1
Section 1, T. 31 N., R. 109 W.	6
Section 12, T. 31 N., R. 109 W.	2
Section 11, T. 31 N., R. 109 W.	1
Section 16, T. 31 N., R. 109 W.	4
Section 15, T. 31 N., R. 109 W.	1
Section 21, T. 31 N., R. 109 W.	7
Section 20, T. 31 N., R. 109 W.	1
Section 29, T. 31 N., R. 109 W.	1
Section 33, T. 31 N., R. 109 W.	1
Section 6, T. 30 N., R. 109 W.	1
Section 5, T. 30 N., R. 109 W.	3
Section 4, T. 30 N., R. 109 W.	1
Total	196

Under this alternative, BLM would avoid placement of well pads on Federal lands and minerals within 0.25 miles of occupied dwellings. Where possible, these well pads would be relocated outside the 0.25 mile buffer area and the well would be directionally drilled to the desired bottomhole. In some cases, however, the well pad could be eliminated altogether because of other surface constraints. Table 4-20 lists the 16 potential well pad locations on Federal lands and minerals affected by the BLM 0.25 mile occupied dwelling mitigation guideline. Anticline development would reduce the potential number of well pad locations within 0.25 miles of an occupied dwelling by 19 compared to the Project Wide Scenario. BLM's Mitigation Guidelines may reduce impacts to several residences located adjacent to Federal lands and minerals. However, the majority of the residences in the project area are located on private lands and minerals away from Federal lands and BLM's Mitigation Guideline would not reduce impacts to these areas.

RP Alternative on Federal Lands and Minerals.

This alternative would avoid surface disturbance on Federal lands and minerals within 0.25 miles of residences, subdivisions, or areas zoned for residential use. The 24 potential well pad locations listed on Table 4-21 would either be eliminated or relocated to outside the 0.25 mile buffer. Anticline development would eliminate 27 potential well pads within 0.25 miles of an occupied dwelling on Federal lands and minerals that could be drilled under the Project Wide Scenario.

While this alternative would reduce some of the impact in the Residential Areas SRMZ, most of the impacts would persist because most of the lands and minerals in this SRMZ are non-Federal. Under this alternative, potential well pad locations would not occur within the Residential Areas SRMZ on Federal lands and minerals. However 17 potential well pad locations would remain in the SRMZ on private and state lands and minerals within the anticline crest area. The number of potential well pad locations on non-Federal lands and minerals within 0.25 miles of occupied dwellings, subdivisions or subdivided lands or areas zoned as residential by Sublette County are listed in Table 4-22. Significant impacts to residences could still occur with this RP Alternative.

Table 4-18 Potential Well Pad Locations in and within 0.25 Miles of Subdivisions and Subdivided Lands under the Anticline Crest Scenario				
Subdivision Name	Type	Acres in the Anticline Crest Area	Potential Well Pad Locations Within the Subdivision or Subdivided Lands	Potential Well Pad Locations Within 0.25 Miles of the Subdivision or Subdivided Lands
Redstone New Fork River	Subdivision	58	5	24
Bloom	Subdivision	15	1	6
Valley Hills	Subdivision	0	0	2
Merritt, Harold	Lot Division	10	1	5
Hopkins	Lot Division	2	0	2
Industrial Site	Subdivision	100	3	13
Total		185	10	52

Table 4-19 Potential Well Pad Locations in and within 0.25 Miles of Areas Zoned for Residential Use Under the Anticline Crest Scenario.			
Residential Zone	Total Acres in Anticline Crest Area	Potential Well Pad Locations Within the Residential Zone	Potential Well Pad Locations Within 0.25 Miles of the Residential Zone
Rural residential	20	0	10
Rural residential 10	58	1	9
Rural residential 20	2	1	2
Rural residential 5	5	0	4
Rural residential mobile/manufactured home 10	0	0	0
Total	85	2	25

Table 4-20 Potential Well Pad Locations That Would be Eliminated or Relocated on Federal Lands and Minerals Under the Anticline Crest Scenario by Imposing a 0.25 Mile Protective Buffer Around Occupied Dwellings		
Potential Well Pad Location	Legal Location	Federal Lease Number
8-1	Section 1, T. 33 N., R. 110 W.	WYW128254
16-1	Section 1, T. 33 N., R. 110 W.	WYW128254
1-12	Section 12, T. 33 N., R. 110 W.	WYW128255
2-12	Section 12, T. 33 N., R. 110 W.	WYW128255
8-12	Section 12, T. 33 N., R. 110 W.	WYW128255
5-6	Section 6, T. 33 N., R. 109 W.	WYW128176
9-6	Section 6, T. 33 N., R. 109 W.	WYW130234
14-6	Section 6, T. 33 N., R. 109 W.	WYW128176
12-5	Section 5, T. 33 N., R. 109 W.	WYW130234
5-1	Section 1, T. 31 N., R. 109 W.	WYW6270
6-1	Section 1, T. 31 N., R. 109 W.	WYW6270
12-1	Section 1, T. 31 N., R. 109 W.	WYW6270
9-2	Section 2, T. 31 N., R. 109 W.	WYW6270
3-10	Section 10, T. 31 N., R. 109 W.	WYW6270
5-10	Section 10, T. 31 N., R. 109 W.	WYW6270
13-10	Section 10, T. 31 N., R. 109 W.	WYW6270

Table 4-21

Potential Well Pad Locations That Would be Eliminated or Relocated on Federal Lands and Minerals by Imposing a 0.25 Mile Protective Buffer Around Occupied Dwellings, Areas Zoned for Residential Use and Subdivisions and Subdivided Lands for the RP Alternative on Federal Lands and Minerals

Potential Well Pad Location	Legal Location	Federal Lease Number
2-1	Section 1, T. 33 N., R. 110 W.	WYW128254
7-1	Section 1, T. 33 N., R. 110 W.	WYW128254
8-1	Section 1, T. 33 N., R. 110 W.	WYW128254
9-1	Section 1, T. 33 N., R. 110 W.	WYW128254
15-1	Section 1, T. 33 N., R. 110 W.	WYW128254
16-1	Section 1, T. 33 N., R. 110 W.	WYW128254
1-12	Section 12, T. 33 N., R. 110 W.	WYW128255
2-12	Section 12, T. 33 N., R. 110 W.	WYW128255
8-12	Section 12, T. 33 N., R. 110 W.	WYW128255
5-6	Section 6, T. 33 N., R. 109 W.	WYW128176
9-6	Section 6, T. 33 N., R. 109 W.	WYW130234
10-6	Section 6, T. 33 N., R. 109 W.	WYW130234
12-6	Section 6, T. 33 N., R. 109 W.	WYW128176
14-6	Section 6, T. 33 N., R. 109 W.	WYW128176
3-7	Section 7, T. 33 N., R. 109 W.	WYW130234
12-5	Section 5, T. 33 N., R. 109 W.	WYW130234
14-5	Section 5, T. 33 N., R. 109 W.	WYW130234
5-1	Section 1, T. 31 N., R. 109 W.	WYW6270
6-1	Section 1, T. 31 N., R. 109 W.	WYW6270
12-1	Section 1, T. 31 N., R. 109 W.	WYW6270
8-2	Section 2, T. 31 N., R. 109 W.	WYW6270
3-10	Section 10, T. 31 N., R. 109 W.	WYW6270
5-10	Section 10, T. 31 N., R. 109 W.	WYW6270
13-10	Section 10, T. 31 N., R. 109 W.	WYW6270

Table 4-22

Number of Potential Well Pad Locations Under the Anticline Crest Scenario on Private and State Lands and Minerals and within the Residential Areas SRMZ

Location	Number of Potential Well Pad Locations
Section 31, T. 34 N., R. 109 W.	2
Section 1, T. 33 N., R. 110 W.	1
Section 6, T. 33 N., R. 109 W.	7
Section 5, T. 33 N., R. 109 W.	1
Section 1, T. 31 N., R. 109 W.	4
Section 12, T. 31 N., R. 109 W.	1
Section 11, T. 31 N., R. 109 W.	1
Total	17

Pad Drilling and Centralized Production Facilities.

These drilling options would have the same impacts to residential areas as discussed for the RP Alternative on Federal Lands and Minerals under the Project Wide Scenario.

RP Alternative on All Lands and Minerals.

Under this alternative, wells would not be drilled anywhere within the Residential Areas SRMZ. Consequently, the impacts described above would not occur. The 17 well pad locations listed on Table 4-22 would not be drilled. Compared to the Project Wide Scenario, development limited to the anticline crest would reduce the number of wells in the Residential Areas SRMZ from 196 to 17 on private and state lands. This alternative could only be implemented through changes in Sublette County

zoning ordinances or by voluntary commitments from the operators.

Pad Drilling and Centralized Production Facilities.

These drilling options would have the same impacts to residential areas as discussed for the RP Alternative on Federal Lands and Minerals under the Project Wide Scenario.

4.6.3.4 No Action Exploration/Development Scenario. The No Action Exploration/Development Scenario would eliminate all of the impacts to land use and residential areas that have been described above.

4.6.4 Additional Mitigation Opportunities. The BLM cannot impose mitigation measures that are on private or state lands - their adoption would be required by other governmental entities or would be strictly voluntary on the part of the operators.

Residential Mitigation Opportunity 1. To avoid impacts associated with noise from drilling near residential areas, drilling could be limited to winter months (outside of big game winter ranges) when the residents usually keep their windows closed. Extraordinary care should be taken to eliminate all possible sources of noise from the drilling and testing operations. Temporary noise barriers should be considered to lessen noise on adjacent property owners. Noise dampening around engines could be considered (including foam insulation around drilling rigs).

Residential Mitigation Opportunity 2. Lights from drilling rigs and other equipment could be managed so that they point away from adjacent residences. While still maintaining a safe working environment, use of light should be minimized to the extent possible.

Residential Mitigation Opportunity 3. As a safety precaution and to reduce odors and other nuisances, any wells drilled within 0.25 miles of residential areas could use a closed drilling system so that no pit is constructed. In addition, the flare pit should be replaced with a separator and all condensate and fracture fluids hauled from the site and disposed of at an approved location. Fencing could be considered to prevent access to the sites.

Residential Mitigation Opportunity 4. If drilling occurs in a residential area and it is not possible to avoid using subdivision streets to access the drilling site, the operators should obtain city council approval and do everything possible to minimize traffic in the area. Strict enforcement of speed limits would be necessary. Road maintenance and repair should be required of the operators.

Residential Mitigation Opportunity 5. The operators should install vapor recovery equipment on all production equipment in the Residential Areas SRMZ. This equipment should be designed so that it controls emissions of all VOCs. The equipment should be adequately maintained and properly operated. The operators should respond diligently to adjacent property owner complaints of odor.

Residential Mitigation Opportunity 6. As with any facility that stores flammable materials, the risk exists for an emergency situation at production facilities. It will be essential that emergency medical and fire and rescue personnel in the county be thoroughly trained on how to deal with all potential incidents at production facilities. Adjacent landowners should be adequately trained to recognize an emergency situation and how to notify the proper officials. Training should focus on both drilling and production activities.

Residential Mitigation Opportunity 7. To protect property values to the extent possible, the operators should hire a qualified landscape architect to develop a variety of schemes and treatments to hide the production facilities so they are not so noticeable to area residents. In addition, production facilities in residential areas should be centralized and the location selected based on the least impact to the area residents. Methods of screening should extend beyond typical vegetative means and include more permanent solutions such as textured concrete walls, buried facilities, etc. Residents of these areas should be involved in developing these techniques.

Residential Mitigation Opportunity 8. The Sublette County Planning and Zoning Commission should address the compatibility of oil and gas development in all of the zoning districts in the county. Standards should be developed and regulations adopted to address situations where oil and gas development and existing land uses are considered incompatible.

Residential Mitigation Opportunity 9. The use of natural gas burning engines rather than diesel burning engines would reduce odor. Generally, drilling rigs with natural gas engines are not available in the Rocky Mountains and would have to be moved from the Gulf Coast area.

4.7 Recreation Resources

4.7.1 Scoping Issues. Several issues were raised during scoping regarding potential impacts to recreation. These issues are summarized below:

1. Address conflicts with recreational use of the Mesa.
2. The Mesa is a special area for bicycling and walking.
3. No development should occur in popular recreation areas.
4. Address impacts to the recreational use of the Lander Trail.

Most of the scoping issues were focused on the north end of the project area near Pinedale. In addition, several comments were received which pointed out the economic value of recreation resources. Those issues are addressed in Section 4.4 of this chapter.

4.7.2 Significance Criteria. Several specific areas have been defined where project-related activities would conflict with current recreation use. The impacts associated with these conflicts are considered significant if:

- project-related activities result in long-term elimination or reduction of recreation use in any of these areas; or
- any of the alternatives result in a level of development which is incompatible with the stated objectives of special recreation management areas.

Based on these criteria, a significant impact to dispersed recreation use by all alternatives, except the No Action Exploration/Development Scenario, is anticipated in the area immediately south of Pinedale, along the Pinedale South Road, if project development is extensive in this area and use of the Pinedale South or Mesa roads in this area by project-related traffic increases. In addition, a significant impact is predicted to a very small portion of the Wind River Front Special Recreation Management Area

under the Project Wide and Anticline Crest scenarios for the SS Alternative and RP Alternative on Federal Lands and Minerals.

4.7.3 Alternative Impacts

4.7.3.1 Summary of Impacts Common to All Alternatives (Except the No Action Exploration/Development Scenario). Studies of workers on oil and gas projects have found that the immigrant workforce typically participates in outdoor recreation at lower levels than the existing population (Wyoming Recreation Commission, 1987). In addition, these workers typically do not recreate in the vicinity of project sites and they leave the project area during their days off. Therefore, it is expected that there would be a negligible increase in the use of the PAPA for recreation. The potential exists that immigrant workers associated with the project may impact recreation resources by parking overnight and camping or setting up residence at recreation sites or facilities. Typically, these types of problems are generated when adequate housing is not available. Some isolated cases of illegal camping on public lands or at public recreation facilities may occur.

Dispersed Recreation. Open space and solitude best describe the feeling one gets when traveling through most of the project area. Some of the area is inaccessible by vehicles and when one walks away from one of the few roads in the area, it is difficult to find evidence of human activity. The views from most of the project area, particularly the Mesa, are exceptional. To the east is the celebrated Wind River Range and to the west the Wyoming Range. In the project area are both the Green and New Fork rivers which offer exceptional fishing opportunities.

Project development and operation would affect the visual and aesthetic quality associated with dispersed recreational experiences (e.g. hunting, fishing, mountain biking, etc.) by increasing traffic, producing noise and dust and by adding production facilities and other disturbances to the landscape which would cause a loss of open space and solitude. These impacts would be most severe on the north end of the PAPA near Pinedale where residents use the area regularly. However, other areas within the PAPA that are used for dispersed recreation could also be impacted by project development. For example, hunters may find it unsafe to use some areas because of the density of development or they may have a less rewarding experience if project

activities affect wildlife populations in the area. People fishing or floating on the Green or New Fork rivers in the project area may be discouraged by project activities adjacent to these rivers which could impact their recreational experience. Individuals visiting the Lander Trail in the PAPA to experience the historic setting of the area may also be affected by the industrial change in the landscape from development. Therefore, these and other recreationists may be displaced from traditional use areas. This would be a significant impact.

During scoping, local residents noted that they use the area southwest of Pinedale on Federal lands for recreation. Generally, the area most used for recreation is along the Pinedale South and Mesa roads in T. 33 N., R. 109 W. and R. 110 W. Because these lands are in close proximity to Pinedale, town residents frequently use the area for walking, wildlife viewing, jogging, bike riding, as well as other activities. During the scoping workshops, many people indicated that one of the biggest potential conflicts between the project and existing land use was in this area. Unfortunately, no information is available about the level of use that occurs on these lands. However, as Pinedale grows, more people are expected to venture onto these lands to recreate.

Three Federal leases encompass most of the area adjacent to Pinedale which receives most of the recreation use (WYW130234, WYW8593 and Sections 12 and 13 of WYW128255). Lease WYW8593 was issued in 1951. The other leases were issued in the 1990s. There are a number of restrictions (winter range, VRM Class II, etc.) that apply to portions of these leases.

If extensive development occurs in the area adjacent to Pinedale, a significant impact to recreation use would be expected. Extensive oil and gas development would likely make the area unattractive to recreation users and they may be inclined, because of noise, dust, risk of being hit, etc., to find new areas for recreation. It is impossible to predict how many recreation users would be affected and what level of development would preclude an area from being used for recreation. However, because recreation in these areas is somewhat tied to the Pinedale South and Mesa roads, it is reasonable to conclude that recreation use may be more adversely affected by noise and dust and increased levels of traffic associated with drilling of wells than from the presence of operating wells in the area. If extensive drilling and other related

development activities occur in this area, or the roads currently used by recreationists are used extensively by project-related traffic, it is likely that recreation use of the area would be displaced for the long-term. Such an impact is considered significant.

As discussed in Section 3.8.3 and shown on Figure 3-8 most of the project area is open for ORV use. Generally, the area south of the New Fork River is designated in the Pinedale RMP as a general ORV open area and is open year-round to ORV use. On the Mesa, the RMP restricts travel during the winter to protect deer and antelope on winter ranges. However, in both of these areas, ORV travel can occur anywhere (i.e., is not limited to only existing roads or trails). If ORV use is allowed to continue in the project area without being restricted it will compound impacts to wildlife and other sensitive resources under any of the project development scenarios and levels of development. These impacts will be compounded because of the additional project disturbance from well pads, roads and pipelines and because the traffic levels in the project would increase dramatically.

Mesa Mountain Bike Path. The BLM Pinedale Field Office has been evaluating the development of the Mesa Mountain Bike Path for a number of years. Development of the bike path reached a standstill because of low priority status, lack of funding and the lack of a recreation planner on the field office staff. As can be seen on Figure 3-8, the trail is almost entirely within the PAPA and the portion of the trail outside the project area would follow roads that would most likely be used by some project traffic. It is probably prudent that the path chosen for this development be reevaluated since all project development scenarios and alternatives would be disruptive to trail users. The reevaluation should consider whether it is possible to construct the proposed route to standards which would accommodate all uses safely.

Wind River Front Special Recreation Management Area. Three leases in the PAPA (WYW137240, WYW137342, and WYW143651) contain controlled surface use stipulations that state the following "surface occupancy or use within the proposed Wind River Front SRMA will be restricted or prohibited unless the operator and surface managing agency arrive at an acceptable plan for mitigation of anticipated impacts". This requirement would be applied to all the leases in the Wind River Front SRMA (including WYW141753).

Specific recommendations are contained in the Green River RMP (BLM, 1992) that suggest how the development of oil and gas resources in the SRMA would occur. Specifically, the RMP states that the following would be used to protect the SRMA:

- apply new management guidelines and restrictions on access roads;
- apply controlled surface use requirements to surface disturbing activities;
- design multiple wells and production facilities to occupy one disturbed site;
- require remote control operations which would limit the amount of vehicle traffic;
- require new roads to be designed so that they are not straight lines; and
- require linear facilities to follow existing routes and previously disturbed areas.

Impacts to this SRMA depend on the level of development that would occur and are discussed in the project alternatives.

Compression. All of the proposed compressor station sites (except Ultra's) are located on the existing sales gas pipeline corridor adjacent to existing roads. Impacts to dispersed recreational activities would be minimized with these locations because the existing roads and pipeline corridor have already changed the open landscape setting. The site proposed by Jonah Gas in Section 3, T. 31 N., R. 109 W. is located at their existing Nerd Farm. Western Gas' proposed site in Section 34, T. 29 N., R. 108 W. is located at their existing compressor station site in the Jonah II Field. Because these sites are currently developed and within an industrial setting, construction at these sites would not contribute additional recreational impacts.

Sales Pipeline. No important recreation sites or activities have been identified in the vicinity of the proposed sales pipeline corridor. Impacts to recreation from construction or operation of pipelines in this existing utility corridor are not anticipated.

BP Amoco Field Office. BP Amoco's proposed field office would be located immediately off of the Luman Road which is the main access into the Jonah II Field. No impacts to recreation sites would occur and impacts to dispersed recreation are not expected. Dispersed recreation in the location of the field office is currently impacted by traffic to and from the Jonah II Field.

4.7.3.2 Project Wide Exploration/Development Scenario

Standard Stipulations Alternative. The 500 and 700 well pad development levels for the project alternatives would have the same potential to impact recreation. However, the 700 well pad development level would have a higher probability to cause impacts to visual and aesthetic quality of the project area because of the disturbance from 200 additional well pads, associated roads and pipelines. Although loss of open space and solitude in the project area could occur with the 500 well pad development level, this impact would be more prevalent and widespread with the 700 well pad development level.

Recreation Sites. This SS Alternative has the potential to directly impact a number of recreation sites, although in no case are impacts to recreation sites expected to be significant or long-term. There are a number of recreation sites located in the project area. Some of these, such as the New Fork River Campground, are well developed. Others are not developed and consist primarily of fishing access and float access to the New Fork River. A list of these sites, their location, and potential well pad locations within 0.25 miles of each of the sites is provided in Table 4-23.

On non-Federal lands and minerals, there are no regulatory controls imposed by landowners or agencies that limit impacts to recreation sites. On Federal lands and minerals, protective measures currently enforced apply only to the New Fork River Campground (i.e., developed recreation sites). Consequently, only one Federal lease in the project area contains a lease stipulation designed to protect a recreation site. Lease WYW124623 contains the following stipulation "*In order to protect the New Fork River Campground, the district manager reserves the right to prohibit surface disturbance within 1/4 mile in T30N, R109W, Section 5, lots 2-5. Modifications to this limitation may be approved in writing by the authorized officer*". Potential well pad locations on Federal lands and minerals within 0.25 miles of the New Fork River Campground have been eliminated. However, approximately 25 percent of the 0.25 mile buffer area around the campground occurs on non-Federal lands and minerals. One potential well pad site occurs in this location (8-5; in Section 5, T. 30 N., R. 109 W.). Even if the 8-5 well is drilled adjacent to the New Fork River Campground, the impact is

Table 4-23
Potential Well Pad Locations within 0.25 Miles of Recreation Sites in the Project Area

Site	Legal Location	Well Pads Within 0.25 Miles	Surface/Mineral Ownership of Well Pad
Fishing access	Section 3, T. 33 N., R. 110 W.	3-4	Federal/Federal
		5-4	private/private
New Fork River Float Access	Section 16, T. 33 N., R. 109 W.	1-16	state/state
		16-9	private/private
		13-10	private/private
		4-15	private/private
WGFD's New Fork River Fishing Access	Section 36, T. 33., R. 109 W.	5-36	state/state
		6-36	state/state
		11-36	state/state
		13-36	state/state
		14-36	state/state
Fishing access	Section 1, T. 32 N., R. 109 W.	3-1	private/private
Fishing access	Section 12, T. 31 N., R. 109 W.	10-12	Federal/Federal
Fishing access	Section 15, T. 31 N., R. 109 W.	2-15	private/private
		7-15	private/private
New Fork Campground	Section 5, T. 30 N., R. 109 W.	8-5	private/private
Fishing access	Section 4, T. 31 N., R. 108 W.	12-4	Federal/Federal
		8-5	private/private
Pinedale Float Access	Section 36, T. 33 N., R. 109 W.	5-36	state/state
		6-36	state/state
		11-36	state/state
		12-36	state/state
		14-36	state/state

The location of these sites is provided on Figure 3-8.

anticipated to be short-term and insignificant because drilling activities would only be noticeable from the campground for a couple of months and the activity would be across the New Fork River.

Potential well pad locations are adjacent to several recreation sites managed by the WGFD for float and fishing access on the New Fork River. The locations of the sites are shown on Figure 3-8. The WGFD provides float access on the New Fork River on the south side of the Pinedale South Road in Section 16, T. 33 N., R. 109 W. The area surrounding this access site is state- and privately-owned. Under this alternative, four potential well pad locations occur within 0.25 miles of the float access (1-16, 16-9, 31-10, and 4-15 in T. 33 N., R. 109 W.). The 1-16 well would be located on state lands and minerals in close proximity (less than 400 feet) to the

float access parking lot and it is likely that traffic to this well pad would travel through the parking lot of the float access site. Another WGFD fishing access is located on the New Fork River in Section 36, T. 33., R. 109 W. There are 5 potential well pad locations within 0.25 miles of this undeveloped site, all of which are on state lands and minerals (5-36, 6-36, 11-36, 13-36 and 14-36).

Only one potential well pad (the 3-1 well on private lands and minerals) is located within 0.25 miles of the fishing access in Section 1, T. 32 N., R. 109 W. Other potential well pads on Federal lands and minerals adjacent to the fishing access site have been eliminated because of conflicts with wetlands and flood plains.

Two potential well pads occur within 0.25 miles of the fishing access in Section 4, T. 31 N., R. 108 W. The 8-5 well would be located on private lands and minerals while the 12-4 would be located on Federal lands and minerals. The fishing access in Section 15, T. 31 N., R. 109 W. would have two potential well pad locations within 0.25 miles (2-15 and 7-15). Both potential well pad locations are on private lands with private minerals. One potential well pad location (10-12) would be within 0.25 miles of the fishing access in Section 12, T. 31 N., R. 109 W.

Dispersed Recreation. Under this alternative, a total of 126 potential well pad spots could be developed on the 3 Federal leases adjacent to Pinedale which receives most of the recreation use (leases WYW130234, WYW8593 and Sections 12 and 13 of WYW128255) (see Figure 4-4). If extensive development occurs in the area adjacent to Pinedale, a significant impact to recreation would be expected. Extensive oil and gas development would likely make the area unattractive to recreation users and they may be inclined, because of noise, dust, risk of being hit, etc., to find new areas for recreation. It is impossible to predict how many recreation users would be affected and what level of development would preclude an area from being used for recreation. However, because recreation in these areas somewhat coincide with the Pinedale South and Mesa roads, it is reasonable to conclude that recreation use may be more adversely affected by noise and dust and increased levels of traffic associated with drilling of wells than from the presence of operating wells in the area. If extensive drilling and other related development activities occur in this area, or the roads currently used by recreationists are used extensively by project-related traffic, it is likely that recreation use of the area would be displaced for the long-term. Such an impact would be considered significant.

Wind River Front Special Recreation Management Area. Under the SS Alternative there are 3 state leases in the SRMA that are not subject to any of the SRMA mitigation measures listed above. These include one 640-acre (Section 36, T. 29 N., R. 107 W.), two 40-acre (Sections 13 and 14, T. 36 N., R. 107 W.), and a portion of another 640-acre (Section 36, T. 30 N., R. 107 W.) lease. In total, SRMA restrictions can be imposed on 4,311 of the 5,122 total acres in the SRMA in the PAPA. If full development occurs in this portion of the project area, up to 16 well pads could be drilled in the state leases in the SRMA. This level of development is

inconsistent with the objectives for managing the SRMA and would, therefore, result in a significant impact to this small portion of the Wind River Front SRMA.

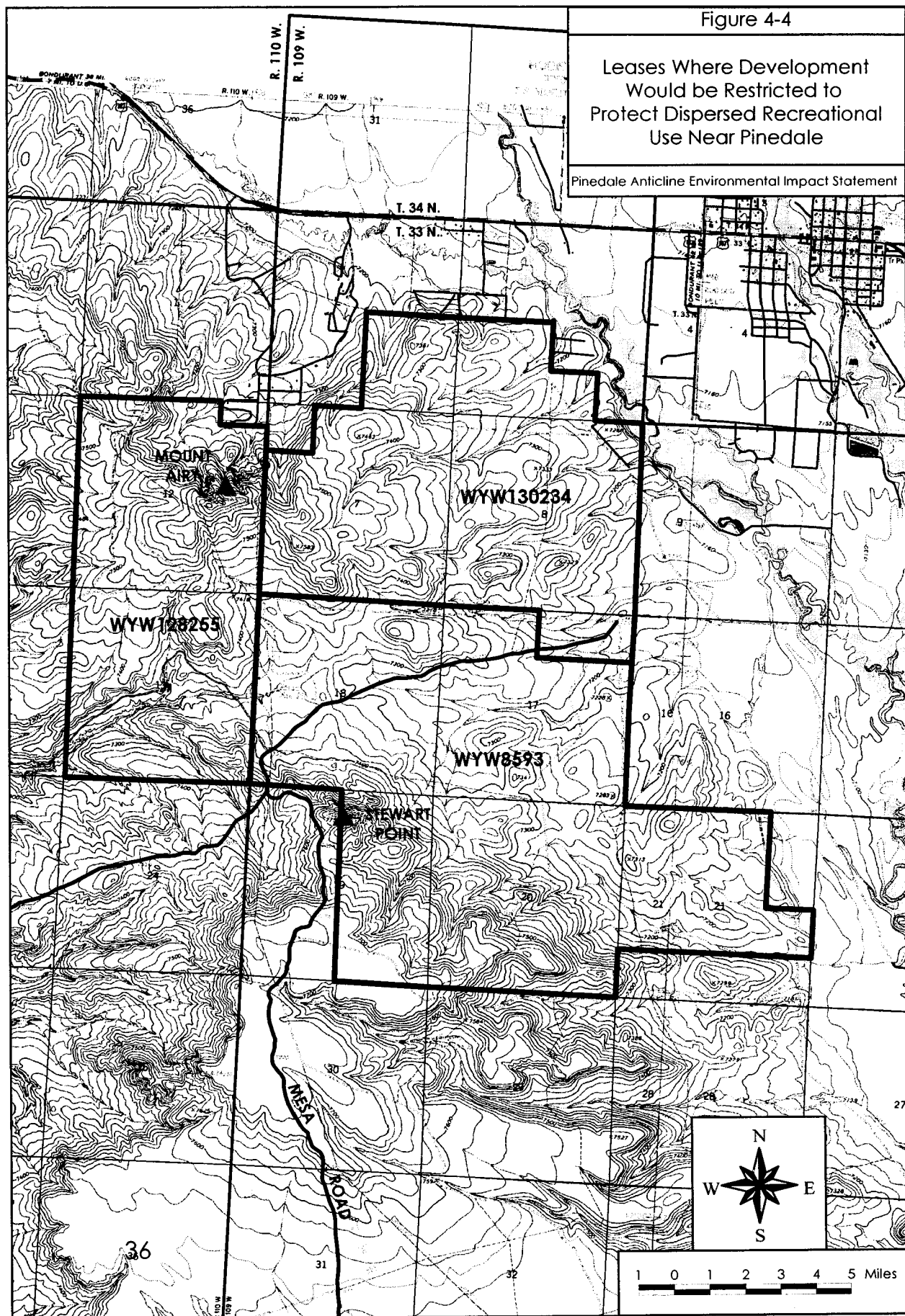
RP Alternative on Federal Lands and Minerals.

Implementation of this RP Alternative would impose a 0.25 mile buffer on all Federal lands and minerals for other recreation sites in the PAPA. Under this alternative, well pads 12-4 (Section 4, T. 31 N., R. 108 W.), 3-4 (Section 3, T. 33 N., R. 110 W.) and 10-12 (Section 12, T. 31 N., R. 109 W.) which are located adjacent to the fishing access points would not be developed.

To protect recreation use southwest of Pinedale, this RP Alternative would limit the number of well pads/section in leases WYW130234, WYW8593, and Sections 12 and 13 of WYW128255 to no more than 4/section. The number of potential well pads on these Federal leases would be reduced from 126 to 36. There are no small, isolated leases in this area that would require the construction of a fifth well pad in any of the sections within the leases. The BLM could require that wells in these leases that are not located in big game winter range, be drilled in the winter when potential conflicts with recreation users are at a minimum. This is consistent with recommendations made to reduce noise at residences adjacent to these leases. Because of conflicts with recreation and other resources (particularly visual resources), BLM would consider not reissuing these leases if they expire.

While this alternative would reduce impacts to recreation, significant impacts would still remain at 4 well pads/section. Increased dust, traffic and noise, even though expected to be less severe than the SS Alternative, may discourage some recreation use of this area. The impact would be long-term and significant. Impacts to the Wind River Front SRMA would be the same as those described above for the SS Alternative.

Pad Drilling. The use of pad drilling would be implemented in the Wind River Front Area and within the three Federal leases that are adjacent to the Town of Pinedale. Pad drilling in other SRMZs in the project area would limit the number of wells per section and the disturbance from roads and pipelines. The reduction in well pad density should minimize the impact to open space and human presence in the project area. However, the impacts would still be



considered significant, particularly in the area adjacent to the Pinedale South and Mesa roads.

Centralized Production Facilities. In the short-term, centralized production facilities would not reduce impacts to recreation because it would not minimize the density of well pads, roads or pipelines. However, in the long-term, during operations, human presence and visual impacts may be reduced with the use of CPF since it would not be necessary to visit each well pad in the project area on a daily basis. Production equipment would not be located at each well pad so the visual intrusion of these well pad production facilities on the landscape would be reduced. A larger portion of the well pad would be reclaimed in the short-term. Significant impact to recreation use would still occur, however the magnitude would be less over the long-term.

RP Alternative on All Lands and Minerals. This alternative would extend the 0.25 mile protective buffer around all recreation sites in the project area regardless of surface or mineral ownership. Such protection would eliminate all of the potential well pad locations identified in Table 4-23 on non-Federal lands and minerals. Under this alternative, the state leases in the Wind River Front SRMA would be subject to the same restrictions as the Federal leases and all activity within the SRMA would become compatible with the SRMA objectives. Significant impacts to the small portion of the Wind River Front SRMA in the project area would be eliminated: conflicts with recreation use south of Pinedale would remain. Therefore, a significant impact to recreation use in the area adjacent to the Pinedale South and Mesa roads would remain under this alternative. The only way to avoid significant impacts to recreation would be to prohibit development of the leases identified on Figure 4-4 which is not practicable.

Pad Drilling and Centralized Production Facilities. These measures would have the same impacts as discussed for the RP Alternative on Federal Lands and Minerals. Significant impacts would be reduced but not eliminated.

4.7.3.3 Anticline Crest Exploration/ Development Scenario.

Standard Stipulations Alternative. This development scenario would have the same potential impact as discussed for the Project Wide Scenario. However, development would be confined to a much

smaller portion of the PAPA (approximately one-third of the area). The impact difference between the 500 and 700 well pad development levels within the anticline crest area would likely be small compared to the Project Wide Scenario. This is because the impacts to recreation (i.e., loss of open space, solitude, etc.) in the anticline crest area would likely occur from the 500 well pad development level. The addition of 200 well pads and associated roads and pipelines for the 700 well pad development level may not be a noticeable impact once the 500 well pad level of development is reached.

Recreation Sites. This development scenario would reduce the number of recreation sites in the PAPA from 9 to 3 that could potentially be impacted because of the concentrated development along the anticline crest. Table 4-24 provides the recreation sites that occur within the anticline crest along with the potential well pads that are within 0.25 miles of these sites. Because all of the recreation sites that occur within the anticline crest are undeveloped sites, all of the well pads listed on Table 4-24 could be potentially developed.

Dispersed Recreation. The anticline crest area encompasses about 94 percent (5,144 acres) of the 3 Federal leases that are adjacent to Pinedale (leases WYW130234, WYW8593 and of WYW128255). There would be 7 fewer (119 vs. 126) potential well pads that could be developed on these leases on the anticline crest. If extensive development occurs in this area, a significant long-term impact to recreation use could be expected.

Site	Legal Location	Well Pads Within 0.25 Miles	Surface/Mineral Ownership of Well Pad
Fishing access	Section 12, T. 31 N., R. 109 W.	10-12	Federal/Federal
WGFD's New Fork River Fishing Access	Section 36, T. 33., R. 109 W.	5-36	state/state
		6-36	state/state
		11-36	state/state
		13-36	state/state
Fishing access	Section 15, T. 31 N., R. 109 W.	14-36	state/state
		2-15	private/private
		7-15	private/private

The location of these sites is provided on Figure 3-8.

Anticline crest development would greatly reduce impacts to dispersed recreation activities in areas of the PAPA that are outside the anticline crest area. Development would not be expected or would be from isolated development in hot spots (Section 2.2.2) or from an associated project facility such as a road or pipeline. Undeveloped areas of the PAPA that are not immediately adjacent to the anticline crest area should still provide open space and solitude for numerous dispersed recreation activities. Impacts from development outside the anticline crest (i.e., development in hot spots) would be dependent on location and well pad density.

Wind River Front SRMA. This development scenario would reduce the potential disturbance to this SRMA by approximately 1,743 acres because the anticline crest area would encompass a smaller area of this SRMA in the PAPA. Under this alternative there are 2 state leases in the SRMA that are not subject to any of the SRMA mitigation measures listed above. These include one 640-acre (Section 36, T. 29 N., R. 107 W.) and two 40-acre (Sections 13 and 14, T. 36 N., R. 107 W.) leases. In total, SRMA restrictions can be imposed on 2,659 acres of the total 3,379 acres in the SRMA in the anticline crest area. If full development occurs in this portion of the project area, up to 16 well pads could be drilled in the state leases in the SRMA. This level of development is inconsistent with the objectives for managing the SRMA and would, therefore, result in a significant impact to this small portion of the Wind River Front SRMA.

RP Alternative on Federal Lands and Minerals. This alternative would impose a 0.25 mile buffer on all Federal lands and minerals for other recreation sites in the PAPA. If this were to occur, well pad 10-12 which is located adjacent to the fishing access point in Section 12, T. 31 N., R. 109 W. would not be developed.

This alternative under the Anticline Crest Scenario would have the same impacts as discussed for the Project Wide Scenario for the Federal leases adjacent to Pinedale (WYW130234, WYW8593, and Sections 12 and 13 of WYW128255). However, the number of potential well pads on these leases would be reduced from 36 to 33 because the anticline crest area encompasses a smaller area of these Federal leases.

Impacts to the Wind River Front SRMA would be the same under this RP Alternative as those described above for the SS Alternative.

Pad Drilling. Under this option, pad drilling could be implemented in the Wind River Front SMRA and in the 3 Federal leases that are adjacent to the Town of Pinedale. Pad drilling in other SRMZs in the project area would limit the number of wells per section and the disturbance from associated roads and pipelines. The reduction in well pad density should minimize the impact to open space and human presence in the project area. However, the impacts would still be considered significant, particularly in the area adjacent to the Pinedale South and Mesa roads.

Centralized Production Facilities. In the short-term, centralized production facilities would not reduce impacts to recreation since it would not minimize the density of well pads, roads or pipelines. However, in the long-term, human presence and visual impacts may be reduced with the use of centralized production facilities. The visual intrusion of the well pad production facilities on the landscape would be reduced. A larger portion of the well pad would be reclaimed in the short-term. Significant impact to recreation use would still occur, however the magnitude is expected to be less.

RP Alternative on All Lands and Minerals. This alternative would extend the 0.25 mile protective buffer around all recreation sites in the anticline crest area regardless of surface or mineral ownership. It would eliminate the potential well pad locations identified in Table 4-24 on non-Federal lands and minerals. Under this alternative, the state leases in the Wind River Front SRMA would be subject to the same restrictions as the Federal leases and all activity within the SRMA would become compatible with the SRMA objectives. Significant impacts to the small portion of the Wind River Front SRMA in the anticline crest area would be eliminated. Conflicts with recreation use south of Pinedale would remain, however. Therefore, a significant impact to recreation use in the area adjacent to the Pinedale South and Mesa roads would remain under this alternative. As indicated for the Project Wide Scenario, the only way to avoid significant impacts to recreation would be to prohibit development of the leases identified on Figure 4-4. However, BLM cannot reduce the number of well pads on these leases to less than 4/section.

Pad Drilling and Centralized Production Facilities.

These measures would have the same impacts as discussed for the RP Alternative on Federal Lands and Minerals.

4.7.3.4 No Action Exploration/Development Scenario. Implementation of the No Action Exploration/Development Scenario would eliminate any increased direct or indirect impacts to recreational sites and uses described above for the SS and RP alternatives.

4.7.4 Additional Mitigation Opportunities. There are several mitigation measures which should be implemented to further reduce impacts on recreation resources. The BLM can impose the following mitigation measures as long as they are not on private or state lands or minerals. Adoption of measures on private or state lands might be required by other governmental entities or would be strictly voluntary on the part of the operator.

Recreation Mitigation Opportunity 1. If the operators drill the 8-5 well (located on private lands and minerals) in Section 5, T. 30 N., R. 109 W. adjacent to the New Fork River Campground, impacts could be reduced if drilling occurred during the early spring or late fall when the campground is not in use. This well would be located on the extreme edge of antelope crucial winter range. Drilling should be coordinated, if possible, to comply with seasonal restrictions for antelope.

Recreation Mitigation Opportunity 2. If the 1-16 well in Section 16, T. 33 N., R. 109 W. is drilled, the location should be adjusted so that it is not visible from the float access point on the New Fork River. This well should be drilled in the early spring or late fall when the float access site receives little use. This well pad is on the extreme edge of deer crucial winter range. Drilling should be coordinated, if possible, to comply with seasonal restrictions for deer. If drilling occurs during the summer, access to the well site should be routed away from the parking lot of the float access. The parking lot should not be used for operator or contractor parking. Operators should develop ways to place production facilities out of the view of the access point, if practical. To offset potential impacts to recreation and float-boating use, the operators could voluntarily fund improved access or improve recreation facilities at the site.

Recreation Mitigation Opportunity 3. A conflict with recreation use along the Pinedale South and Mesa roads appears inevitable. A number of people use these roads and adjacent Federal lands for recreation. One way to reduce the impact would be to direct recreation use away from these roads. The BLM, in cooperation with the operators and the community, should consider development of a trail on the north end of the PAPA which could be used by hikers and mountain bikers that would avoid roads used by oil and gas activities. Consideration could also be given to the off-site mitigation opportunity of developing a bike path to Fremont Lake or other biking, jogging and walking trails. Operators and their contractors should avoid the Pinedale South Road to access the Mesa.

Recreation Mitigation Opportunity 4. If extensive development occurs, it is likely that there will be some limited incidences of squatting in campgrounds designated for public use. The operators should inform their employees, contractors and subcontractors that long-term camping (greater than 14 days) on public lands or at public recreation sites is prohibited.

Recreation Mitigation Opportunity 5. The operators should inform their employees, contractors and subcontractors that recreation sites and facilities are not to be used for trash disposal or as a water supply source.

Recreation Mitigation Opportunity 6. The operators should place directional signs as necessary on major access roads to inform hunters and other users that they are entering an oil and gas drilling area. The BLM and WGFD should develop information for hunters that directs them away from areas of extensive development.

Recreation Mitigation Opportunity 7. Traffic in the project area will increase dramatically and will likely result in impacts to wildlife. To allow continued open unregulated ORV use in the areas would exacerbate impacts to wildlife and other sensitive resources. BLM should begin the process of evaluating these areas and updating its RMP to restrict all ORV use to existing roads and trails.

4.8 Visual Resources

4.8.1 Scoping Issues. Many comments were received about protecting visual resources in the project area. Although a few were concerned about degradation of the visual resources throughout the entire project area, most were concerned about impacts from residential areas near Pinedale and along U.S. Highway 191, as summarized below:

1. No development should occur in outstanding scenic areas.
2. Development should conform with Visual Resource Management classifications.
3. Reduce impacts from development on the natural landscape.
4. Keep Pinedale beautiful.
5. Avoid any visual impacts to the side or face of the Mesa.
6. Establish a 1 mile wide "no-development" corridor along both sides of U.S. Highway 191 to protect visual resources.
7. Visual impacts will be greatest on steep slopes.
8. The Pinedale Resource Management Plan Visual Resource Management classifications need to be updated for the EIS.
9. The northern end of the Mesa should not be developed in direct sight of town.
10. Limit development to no more than two locations per section to avoid decreases in areas of beauty.

4.8.2 Significance Criteria. A significant impact to visual resources on Federal lands and minerals is defined as project-related development that would not meet VRM class objectives for an area. A significant impact would occur if oil and gas development becomes the dominant feature in the landscape where objectives for that land are to maintain the existing character of the landscape. A significant impact to visual resources on non-Federal lands and minerals is also defined as an apparent change, to the casual observer, from a natural landscape to an "industrialized appearing" landscape in areas visible from U.S. Highway 191, residential areas and the Town of Pinedale. These are the sensitive viewpoints identified during scoping.

To a certain extent, potential visual resource impacts on Federal lands and minerals may not be as apparent as development on non-Federal lands and minerals because impacts on Federal lands will be primarily middle and background views. Adjacent to

Pinedale and along U.S. Highway 191, lands and minerals are predominantly non-Federal (see Figure 3-1). These areas are the foreground view for the residents of the area and tourists traveling through the area. The Mesa "breaks", foothills and sandstone ridges form the background west of U.S. Highway 191. Development in this background (much of which is VRM Class II) would be considered significant. Based on the significance criteria, significant impacts to visual resources in the project area could occur for all alternatives except the No Action Exploration/Development Scenario.

4.8.3 Alternative Impacts. Visibility analysis conducted for this EIS was explained in Chapter 3. The results of GIS model runs to determine the portion of the project area that is visible from sensitive view points near Pinedale is shown on Figure 3-10. The area (38,938 acres) shown on Figure 3-10 has been identified for this EIS as the Sensitive Viewshed SRMZ. Visual resource impacts in the SRMZ would be most severe because the impacted area would be seen from many points in Pinedale, residential areas and along U.S. Highway 191.

The RMP designated certain portions of the project area as VRM Class II, shown in Figure 3-9. The public, during scoping, indicated that the VRM Class II designation in the Pinedale RMP needs to be updated. While the VRM Class II Area includes restrictions to keep modifications minimal, the remainder of the Sensitive Viewshed SRMZ is designated as VRM Class III and IV in which moderate and extensive modification is allowed. The BLM RMP update should include consideration of expanding the VRM II classification in the area immediately south of Pinedale to incorporate all of the sensitive viewshed shown in Figure 3-10.

4.8.3.1 Summary of Impacts Common to All Alternatives (Except the No Action Exploration/Development Scenario). Open space and solitude best describe the feeling one gets when traveling through most of the project area. Some of the area is inaccessible by vehicles and when one walks away from one of the few roads in the area, it is difficult to find evidence of human activity. The views from most of the project area, particularly the Mesa, are exceptional. To the east is the celebrated Wind River Range and to the west the Wyoming Range. The scenic Green and New Fork rivers attract many fisherman and float boaters. The experience of

viewing these mountain ranges would not be altered, however, development could alter the experience of viewing the Mesa landscape. Like other resources, impacts to visual resources would, to a large extent, depend on the overall surface disturbance, especially disturbance of linear facilities (i.e., roads and pipelines) on slopes, ridges and high points and the density of well pads constructed in a particular area.

BLM's VRM class designations are designed to allow varying levels of change in the landscape (Class II being the lowest and Class IV being the greatest in the PAPA). The management objective of VRM Class II is to retain the existing character of the landscape and the level of change to the character of the landscape should be low and management activities should not attract the attention of the casual observer. In this VRM class, extensive development (i.e., 16 well pads/section and associated roads and pipeline corridors) would not be appropriate. This level of development, if allowed, would cause the classification to change from VRM Class II to IV. Management of visual resources in Class III areas allows for moderate change in the character of the landscape while Class IV areas allows for major modification of the landscape.

There are a number of mitigation measures that BLM would use to meet the VRM objectives in the project area. Site-specific measures would be utilized to reduce the visibility of surface facilities, roads and pipelines. Such measures could include painting facilities earth-tone colors, using topography and/or vegetation to screen surface facilities, roads and pipelines from view, using low profile tanks and/or centralized production facilities, avoiding steep slopes or areas where extensive cuts and fills are necessary. The use of surface pipelines or feathering the edges of linear rights-of-ways so that they blend with the surrounding form and texture of the existing vegetation would also reduce visibility. Avoiding steep slopes (and the need for extensive cuts and fills) would reduce visual impacts. Disturbance can increase by as much as 36 percent for well pads located on slopes between 15 and 25 percent. Effective implementation of revegetation and reclamation procedures would also aid in reducing visual impacts. Other mitigation that the BLM could apply to minimize night lighting affects could include shrouding lights on drill rigs and directing the lights onto the drilling platform or floor so that lights and glare are not directed away from the drilling area.

Night lighting effects can impact areas far from the drilling activity and areas outside of the project area.

The 500 and 700 well development levels for the alternatives would generally have the same potential to impact visual resources. However, the 700 well development level would have a higher probability to cause significant impacts because of the additional disturbance from wells, roads and pipelines. Although the change in the landscape character to an industrial appearing setting could occur at the 500 well development level, the change in the landscape character would be more prevalent or widespread under the 700 well development level.

Compression. All of the proposed compressor station sites are located in VRM Class IV areas. However, the site proposed by Jonah Gas in Section 3, T. 31 N., R. 109 W. is located on the border of a VRM Class III area. Modifications to the landscape at this site have previously occurred because this site is located at the existing Nerd Farm (operated by Jonah Gas). Construction of any of the proposed compressor stations sites would change the existing rangeland landscape to an industrial appearing setting. All of the sites (except Ultra's) are located with an existing utility corridor and are adjacent to roads. The impact would be minimized because the landscape has been partially changed in these areas. The compressor stations would be painted a BLM-approved earthtone color to minimize their visual intrusion.

Sales Pipeline. Because the proposed sales pipeline corridor is an existing utility corridor, additional pipelines would be consistent with visual impacts that already exist in the corridor.

BP Amoco Field Office. BP Amoco's proposed field office would be located in an area designated as VRM Class III. The office location would be adjacent to the Luman Road which provides the main access to the Jonah II Field, and should be screened by hills from U. S. Highway 191. The facility would be painted a BLM-approved earthtone color to blend into the surrounding landscape. Adverse visual impacts are not expected to occur from construction of this office.

4.8.3.2 Project Wide Exploration/ Development Scenario

Standard Stipulations Alternative. A small portion of the project area on Federal lands and minerals (about 5,200 acres) has been designated as VRM Class II. Figure 4-5 shows the Federal leases which overlap the areas designated as VRM Class II in the Pinedale RMP. These leases are listed on Table 4-25. Some of these leases contain specific language that address protection of the VRM Class II areas. That language states *“surface occupancy or use will be restricted or prohibited unless the operator and surface managing agency arrive at an acceptable plan for mitigation of anticipated impacts.”* BLM would impose this requirement on those portions of the leases listed on Table 4-25 that are located within the VRM Class II area. Drilling may be required to protect against natural gas being drained. Under this alternative, a total of 82 potential well pad locations exist in the VRM Class II area on Federal lands and minerals. If the operators intend to develop any of the well pad locations listed on Table 4-25, it would be necessary to develop a plan that demonstrates how development would be compatible with the VRM II objectives. Because wells in areas adjacent to the VRM II areas could significantly affect the integrity of the VRM II, BLM would need to give adjacent wells careful consideration as to placement before approval. BLM would deny any APDs for wells listed on Table 4-25 unless it could be demonstrated that the visual integrity of the Class II area is retained. It is anticipated that many of the potential well pad locations listed on Table 4-25 would not be developed because of potential significant impacts to the integrity of the VRM Class II areas. Individual APDs in VRM II areas would be reviewed on a case-by-case basis.

Under this alternative, as many as 936 potential well pad locations could be developed in the Sensitive Viewshed SRMZ. This alternative would allow development of the Sensitive Viewshed SRMZ at a density of up to 16 well pads/section. Such a well density would result in a significant impact to the Sensitive Viewshed SRMZ. Impacts would be obvious from portions of the Town of Pinedale, residential areas (particularly those to the south of Pinedale), areas near the Mountain Man Museum, along U.S. Highway 191, and from Bargerville. Along most of U.S. Highway 191 the disturbance would be in the middle and background. Development on non-Federal lands in the foreground may be more

noticeable to the casual observer than activities on Federal lands and minerals. Impacts to the visual integrity of the sensitive viewshed would be significant and long-term.

RP Alternative on Federal Lands and Minerals.

Under this alternative, BLM would limit the number of well pads in the Sensitive Viewshed SRMZ (see Figure 3-10) to no more than 4 well pads/section. Within those portions of the sensitive viewshed that are VRM Class II, *“surface occupancy or use will be restricted or prohibited unless the operator and surface managing agency arrive at an acceptable plan for mitigation of anticipated impacts.”* BLM would avoid any surface disturbing activities on slopes in excess of 15 percent (including roads and pipelines). BLM may require the use of centralized production facilities to further minimize visual degradation in the viewshed. Low profile tanks would be required throughout this viewshed on Federal lands and minerals. BLM would consider not reissuing leases in VRM Class II areas if they expire.

Impacts to the sensitive viewshed would be substantially reduced under this alternative. Overall, oil and gas development activities would be noticeable but they are not expected to dominate the landscape on Federal lands and minerals. However, on non-Federal lands and minerals, up to 16 well pads/section could be developed under this alternative. This potential level of development would still result in significant impacts to the foreground view from a number of sensitive view points in and adjacent to the project area.

Mitigation measures for other resources could also be effective in reducing visual impacts in the Sensitive Viewshed SRMZ. Measures to protect wintering deer would avoid surface disturbance within the Mesa Breaks Management Area on Federal lands and minerals and would also reduce visual impacts. This mitigation, if applied, would avoid development on approximately 2,563 acres within the sensitive viewshed.

Pad Drilling. This alternative would require pad drilling in the Sensitive Viewshed SRMZ. If pad drilling were required to protect other resources, it would reduce the overall impacts to visual resources because there would be fewer well pads, roads and pipelines. Pad drilling would reduce overall visual impacts for both the 500 and 700 well pad development levels.

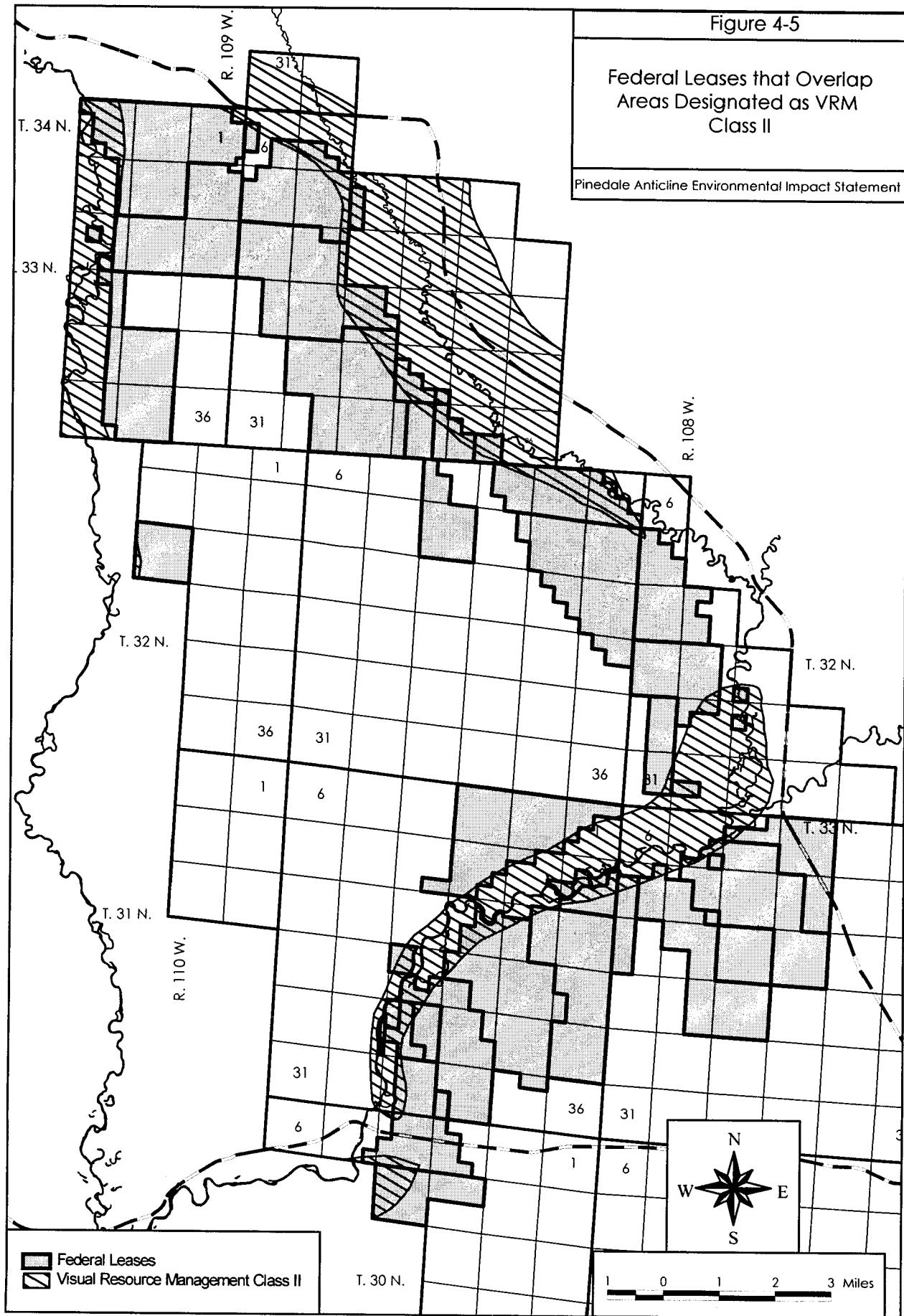


Table 4-25
Federal Leases and Potential Well Pad Locations in VRM Class II Areas in the PAPA on Federal Lands and Minerals

Lease Number	Potential Well Pad Locations in VRM Class II	Legal Location	Lessee	Date Issued
WYW128254	None		HS Resources Inc	1992
WYW128176	5-9	Section 9, T. 33 N., R. 109 W.	Ultra Resources Inc	1992
WYW128176	12-9	Section 9, T. 33 N., R. 109 W.	Ultra Resources Inc	1992
WYW128176	13-9	Section 9, T. 33 N., R. 109 W.	Ultra Resources Inc	1992
WYW130234	9-6	Section 6, T. 33 N., R. 109 W.	HS Resources Inc	1993
WYW130234	11-5	Section 5, T. 33 N., R. 109 W.	HS Resources Inc	1993
WYW130234	12-5	Section 5, T. 33 N., R. 109 W.	HS Resources Inc	1993
WYW130234	14-5	Section 5, T. 33 N., R. 109 W.	HS Resources Inc	1993
WYW130234	15-5	Section 5, T. 33 N., R. 109 W.	HS Resources Inc	1993
WYW130234	1-8	Section 8, T. 33 N., R. 109 W.	HS Resources Inc	1993
WYW130234	2-8	Section 8, T. 33 N., R. 109 W.	HS Resources Inc	1993
WYW130234	8-8	Section 8, T. 33 N., R. 109 W.	HS Resources Inc	1993
WYW130234	16-8	Section 8, T. 33 N., R. 109 W.	HS Resources Inc	1993
WYW130234	1-17	Section 17, T. 33 N., R. 109 W.	HS Resources Inc	1993
WYW8593	8-17	Section 17, T. 33 N., R. 109 W.	Ultra Resources Inc	1951
WYW8593	9-17	Section 17, T. 33 N., R. 109 W.	Ultra Resources Inc	1951
WYW8593	16-17	Section 17, T. 33 N., R. 109 W.	Ultra Resources Inc	1951
WYW8593	1-20	Section 20, T. 33 N., R. 109 W.	Ultra Resources Inc	1951
WYW8593	3-21	Section 21, T. 33 N., R. 109 W.	Ultra Resources Inc	1951
WYW8593	4-21	Section 21, T. 33 N., R. 109 W.	Ultra Resources Inc	1951
WYW8593	6-21	Section 21, T. 33 N., R. 109 W.	Ultra Resources Inc	1951
WYW8593	7-21	Section 21, T. 33 N., R. 109 W.	Ultra Resources Inc	1951
WYW8593	9-21	Section 21, T. 33 N., R. 109 W.	Ultra Resources Inc	1951
WYW8593	10-21	Section 21, T. 33 N., R. 109 W.	Ultra Resources Inc	1951
WYW8593	11-21	Section 21, T. 33 N., R. 109 W.	Ultra Resources Inc	1951
WYW8592	15-21	Section 21, T. 33 N., R. 109 W.	Ultra Resources Inc	1951
WYW8592	16-21	Section 21, T. 33 N., R. 109 W.	Ultra Resources Inc	1951
WYW8592	1-28	Section 28, T. 33 N., R. 109 W.	Ultra Resources Inc	1951
WYW8592	2-28	Section 28, T. 33 N., R. 109 W.	Ultra Resources Inc	1951
WYW8592	8-28	Section 28, T. 33 N., R. 109 W.	Ultra Resources Inc	1951
WYW16167	5-27	Section 27, T. 33 N., R. 109 W.	Ultra Resources Inc	1952
WYW16167	11-27	Section 27, T. 33 N., R. 109 W.	Ultra Resources Inc	1952
WYW16167	12-27	Section 27, T. 33 N., R. 109 W.	Ultra Resources Inc	1952
WYW16167	14-27	Section 27, T. 33 N., R. 109 W.	Ultra Resources Inc	1952
WYW16167	15-27	Section 27, T. 33 N., R. 109 W.	Ultra Resources Inc	1952
WYW16167	1-34	Section 34, T. 33 N., R. 109 W.	Ultra Resources Inc	1952
WYW16167	5-35	Section 35, T. 33 N., R. 109 W.	Ultra Resources Inc	1952
WYW16167	11-35	Section 35, T. 33 N., R. 109 W.	Ultra Resources Inc	1952
WYW143663	1-3	Section 3, T. 32 N., R. 109 W.	Ultra Resources Inc	1997
WYW143663	2-2	Section 2, T. 32 N., R. 109 W.	Ultra Resources Inc	1997

**Table 4-25
Continued**

Lease Number	Potential Well Pad Locations in VRM Class II	Legal Location	Lessee	Date Issued
WYW143663	3-2	Section 2, T. 32 N., R. 109 W.	Ultra Resources Inc	1997
WYW143663	5-2	Section 2, T. 32 N., R. 109 W.	Ultra Resources Inc	1997
WYW143663	6-2	Section 2, T. 32 N., R. 109 W.	Ultra Resources Inc	1997
WYW143663	7-2	Section 2, T. 32 N., R. 109 W.	Ultra Resources Inc.	1997
WYW143663	8-2	Section 2, T. 32 N., R. 109 W.	Ultra Resources Inc	1997
WYW143663	9-2	Section 2, T. 32 N., R. 109 W.	Ultra Resources Inc	1997
WYW143663	5-1	Section 1, T. 32 N., R. 109 W.	Ultra Resources Inc	1997
WYW143663	12-1	Section 1, T. 32 N., R. 109 W.	Ultra Resources Inc	1997
WYW143663	15-1	Section 1, T. 32 N., R. 109 W.	Ultra Resources Inc	1997
WYW143663	16-1	Section 1, T. 32 N., R. 109 W.	Ultra Resources Inc	1997
WYW143660	None		Ultra Resources Inc	1997
WYW143661	12-32	Section 32, T. 32 N., R. 108 W.	Ultra Resources Inc	1997
WYW139396	9-31	Section 31, T. 32 N., R. 108 W.	Ultra Resources Inc	1996
WYW118158	None		Ultra Petroleum USA	1989
WYW142265	None		Ultra Resources Inc	1997
WYW26026	10-12	Section 12, T. 31 N., R. 109 W.	Ultra Resources Inc	1950
WYW6270	None		Ultra Resources Inc	1951
WYW26025	5-14	Section 14, T. 31 N., R. 109 W.	Ultra Resources Inc	1950
WYW26025	10-15	Section 15, T. 31 N., R. 109 W.	Ultra Resources Inc	1950
WYW26025	11-15	Section 15, T. 31 N., R. 109 W.	Ultra Resources Inc	1950
WYW26025	14-15	Section 15, T. 31 N., R. 109 W.	Ultra Resources Inc	1950
WYW143046	3-21	Section 21, T. 31 N., R. 109 W.	Ultra Resources Inc	1997
WYW143046	14-21	Section 21, T. 31 N., R. 109 W.	Ultra Resources Inc	1997
WYW143046	15-21	Section 21, T. 31 N., R. 109 W.	Ultra Resources Inc	1997
WYW118166	3-28	Section 28, T. 31 N., R. 109 W.	Ultra Resources Inc	1989
WYW118166	6-28	Section 28, T. 31 N., R. 109 W.	Ultra Resources Inc	1989
WYW118166	12-28	Section 28, T. 31 N., R. 109 W.	Ultra Resources Inc	1989
WYW128704	5-28	Section 28, T. 31 N., R. 109 W.	McMurry Oil Company	1993
WYW125139	None		Shama Zoe Ltd	1991
WYW124623	6-33	Section 33, T. 31 N., R. 109 W.	Shama Zoe Ltd	1991
WYW124623	11-33	Section 33, T. 31 N., R. 109 W.	Shama Zoe Ltd	1991
WYW124623	14-4	Section 4, T. 30 N., R. 109 W.	Shama Zoe Ltd	1991
WYW115609	2-9	Section 9, T. 30 N., R. 109 W.	Shama Zoe Ltd	1989
WYW115609	4-9	Section 9, T. 30 N., R. 109 W.	Shama Zoe Ltd	1989
WYW115609	5-9	Section 9, T. 30 N., R. 109 W.	Shama Zoe Ltd	1989
WYW115609	6-9	Section 9, T. 30 N., R. 109 W.	Shama Zoe Ltd	1989
WYW115609	11-9	Section 9, T. 30 N., R. 109 W.	Shama Zoe Ltd	1989
WYW115609	12-9	Section 9, T. 30 N., R. 109 W.	Shama Zoe Ltd	1989
WYW115609	13-9	Section 9, T. 30 N., R. 109 W.	Shama Zoe Ltd	1989
WYW113418	2-22	Section 22, T. 33 N., R. 110 W.	Ultra Resources Inc	1988

Table 4-25 Concluded				
Lease Number	Potential Well Pad Locations in VRM Class II	Legal Location	Lessee	Date Issued
WYW128255	None		HS Resources Inc	1992
WYW128254	2-3	Section 3, T. 33 N., R. 110 W.	HS Resources Inc	1992
WYW128254	3-3	Section 3, T. 33 N., R. 110 W.	HS Resources Inc	1992
WYW128254	6-3	Section 3, T. 33 N., R. 110 W.	HS Resources Inc	1992
WYW128254	7-3	Section 3, T. 33 N., R. 110 W.	HS Resources Inc	1992
WYW128254	10-3	Section 3, T. 33 N., R. 110 W.	HS Resources Inc	1992
WYW128254	11-3	Section 3, T. 33 N., R. 110 W.	HS Resources Inc	1992
WYW128254	15-3	Section 3, T. 33 N., R. 110 W.	HS Resources Inc	1992

Centralized Production Facilities. In the short-term, the use of centralized production facilities would not reduce the impacts to visual resources because they would not reduce the initial disturbance from well pads, roads and pipelines in the project area. This mitigation would allow up to 16 well pads/section to be constructed along with their associated roads and pipelines. During development, oil and gas activities would likely dominate the landscape. However, in the long-term, the use of centralized production facilities should reduce visual impacts considerably. This is because tanks and other production equipment would not be required at each well pad. Therefore, a larger area of each well pad could be reclaimed. This would greatly reduce the visibility of well pads and human presence in the area.

RP Alternative on All Lands and Minerals. The purpose of this alternative would be to limit well density throughout the Sensitive Viewshed SRMZ to no more than 4/section. Implementation of this alternative would reduce foreground visual degradation on non-Federal lands and minerals. This is the only alternative under the Project Wide Scenario, except the No Action Scenario, that addresses what may be perceived as uncontrolled industrial -like development on non-Federal lands adjacent to U.S. Highway 191. Implementation of this alternative would require a voluntary commitment from the operators or action on behalf of the county.

Pad Drilling. Pad drilling would reduce potential visual impacts described in the RP Alternative on Federal Lands and Minerals.

Centralized Production Facilities. The impacts of these facilities would be the same as those discussed in the RP Alternative on Federal Lands and Minerals.

4.8.3.3 Anticline Crest Exploration/ Development Scenario. This development scenario would have the same potential impacts to visual resources as described for the Project Wide Scenario. However, with development concentrated along the anticline crest, impacts would be concentrated to an area approximately one-third the size of the PAPA. This development scenario would greatly reduce visual impacts to areas that are off the anticline crest for all of the alternatives and development levels. In addition, this development scenario would minimize foreground impacts from many of the sensitive viewpoints that are in and adjacent to the project area. This is because development on these foreground areas would not be expected to occur.

Standard Stipulations Alternative. This alternative would reduce the potential number of well pads in VRM Class II areas to a total of 28 compared to 82 wells for the Project Wide Scenario. The potential well pad locations that are in VRM Class II areas on Federal lands and minerals within the anticline crest are provided in Table 4-26. As indicated for the Project Wide Scenario, BLM would deny any APDs for wells listed on Table 4-26 unless it could be demonstrated that the visual integrity of the Class II area is retained. It is anticipated that many of the potential well pad locations listed on Table 4-26 would not be developed because of potential significant impacts to the integrity of the VRM Class II areas. Individual APDs in VRM II areas would be reviewed on a case-by-case basis.

Compared to the Project Wide Scenario, which could have development throughout the 38,938 acre Sensitive Viewshed SRMZ, impacts from anticline development would be concentrated to an area of

Table 4-26
Federal Leases and Potential Well Pad Locations in VRM Class II Areas Under the Anticline Crest Scenario on Federal Lands and Minerals

Lease Number	Potential Well Pad Locations in VRM Class II	Legal Location	Lessee	Date Issued
WYW130234	9-6	Section 6, T. 33 N., R. 109 W.	HS Resources Inc	1993
WYW130234	12-5	Section 5, T. 33 N., R. 109 W.	HS Resources Inc	1993
WYW130234	14-5	Section 5, T. 33 N., R. 109 W.	HS Resources Inc	1993
WYW130234	16-8	Section 8, T. 33 N., R. 109 W.	HS Resources Inc	1993
WYW130234	1-17	Section 17, T. 33 N., R. 109 W.	HS Resources Inc	1993
WYW8593	8-17	Section 17, T. 33 N., R. 109 W.	Ultra Resources Inc	1951
WYW8593	9-17	Section 17, T. 33 N., R. 109 W.	Ultra Resources Inc	1951
WYW8593	16-17	Section 17, T. 33 N., R. 109 W.	Ultra Resources Inc	1951
WYW8593	1-20	Section 20, T. 33 N., R. 109 W.	Ultra Resources Inc	1951
WYW8593	3-21	Section 21, T. 33 N., R. 109 W.	Ultra Resources Inc	1951
WYW8593	4-21	Section 21, T. 33 N., R. 109 W.	Ultra Resources Inc	1951
WYW8593	6-21	Section 21, T. 33 N., R. 109 W.	Ultra Resources Inc	1951
WYW8593	7-21	Section 21, T. 33 N., R. 109 W.	Ultra Resources Inc	1951
WYW8593	10-21	Section 21, T. 33 N., R. 109 W.	Ultra Resources Inc	1951
WYW8593	11-21	Section 21, T. 33 N., R. 109 W.	Ultra Resources Inc	1951
WYW8592	15-21	Section 21, T. 33 N., R. 109 W.	Ultra Resources Inc	1951
WYW8592	16-21	Section 21, T. 33 N., R. 109 W.	Ultra Resources Inc	1951
WYW8592	1-28	Section 28, T. 33 N., R. 109 W.	Ultra Resources Inc	1951
WYW8592	2-28	Section 28, T. 33 N., R. 109 W.	Ultra Resources Inc	1951
WYW8592	8-28	Section 28, T. 33 N., R. 109 W.	Ultra Resources Inc	1951
WYW16167	5-27	Section 27, T. 33 N., R. 109 W.	Ultra Resources Inc	1952
WYW16167	11-27	Section 27, T. 33 N., R. 109 W.	Ultra Resources Inc	1952
WYW16167	12-27	Section 27, T. 33 N., R. 109 W.	Ultra Resources Inc	1952
WYW16167	14-27	Section 27, T. 33 N., R. 109 W.	Ultra Resources Inc	1952
WYW26026	10-12	Section 12, T. 31 N., R. 109 W.	Ultra Resources Inc	1950
WYW26025	5-14	Section 14, T. 31 N., R. 109 W.	Ultra Resources Inc	1950
WYW26025	10-15	Section 15, T. 31 N., R. 109 W.	Ultra Resources Inc	1950
WYW128254	2-3	Section 3, T. 33 N., R. 110 W.	HS Resources Inc	1992

about 12,462 acres within the SRMZ. Therefore, potential impacts from anticline development would occur to an area which is less than one-third the size of the entire SRMZ. Under this alternative, there are 311 potential well pad locations that could be developed in the Sensitive Viewshed SRMZ. This is a reduction of 625 potential well pad locations in the SRMZ compared to the Project Wide SS Alternative. This SS Alternative would allow development of the SRMZ at a density of up to 16 well pads/section in areas that are not VRM Class II. Such a well density would result in a significant impact to a portion of the Sensitive Viewshed SRMZ. Impacts would be

noticeable from portions of the Town of Pinedale, residential areas (particularly those to the south of Pinedale), areas near the Mountain Man Museum, along U.S. Highway 191, and from Bargerville. The disturbance would be in the middle and background. Impacts in the sensitive viewshed would be significant and long-term. Foreground visual impacts could be more severe because they would occur on non-Federal lands and minerals where visual quality management objectives have not been established.

The difference in impacts between the 500 and 700 well development levels within the anticline crest

area would likely be small compared to the Project Wide Scenario. This is because most of the impacts to visual resources in the anticline area would likely occur from the 500 well development level. The addition of 200 well pads and associated roads and pipelines for the 700 well development level may not be a particularly noticeable.

RP Alternative on Federal Lands and Minerals.

The mitigation measures that would be applied for this alternative under the Project Wide Scenario would also be implemented for this alternative. Impacts to the sensitive viewshed would be substantially reduced by this alternative compared to the SS Alternative. Overall, oil and gas development activities would be noticeable but they are not expected to dominate the landscape on Federal lands and minerals. However, on non-Federal lands and minerals up to 16 well pads/section could be developed under this alternative. This density of development could occur on approximately 1,259 acres or about 10 percent of the SRMZ within the anticline crest area. This potential level of development could still result in significant impact to this SRMZ.

Pad Drilling. This mitigation measure would use pad drilling in the Sensitive Viewshed SRMZ. However, if pad drilling were required in other SRMZs in the anticline crest area, it would reduce the overall impacts to visual resources because landscape disturbances would be minimized by having fewer well pads, roads and pipelines.

Centralized Production Facilities. In the short-term, centralized production facilities would not reduce the impacts to visual resources because it would not minimize initial disturbance from well pads, roads and pipelines. With this mitigation, up to 16 well pads/section could be drilled during the development period along with the associated roads and pipelines. These development activities would likely dominate the views of the anticline area, especially since development would be concentrated in this area. However, in the long-term, the use of centralized production facilities should reduce visual impacts markedly. This is because tanks and other production equipment would not be required at each well pad. The use of CPF would also allow a larger area of the well pad to be reclaimed which would further reduce visual impacts.

RP Alternative on All Lands and Minerals. This alternative, if implemented, would extend the limit of

4 well pads/section on all lands in the Sensitive Viewshed SRMZ. This would further reduce impacts to the SRMZ by developing the 1,259 acres of private and state lands and minerals in the SRMZ at a density of no greater than 4 well pads/section. Significant short-term impacts may occur in the SRMZ if full development occurs and several rigs are operating in the SRMZ at one time. Implementation of this alternative would require a voluntary commitment from the operators or action on from the county.

Pad Drilling. Pad drilling would reduce potential visual impacts as described in the RP Alternative on Federal Lands and Minerals.

Centralized Production Facilities. The impacts of these facilities would be the same as those discussed for the RP Alternative on Federal Lands and Minerals.

4.8.3.4 No Action Exploration/Development Scenario. Implementation of the No Action Exploration/Development Scenario would eliminate impacts to visual resources. Only those impacts associated with the existing well pads, roads and pipelines on the anticline would persist.

4.8.4 Additional Mitigation Opportunities. There are several mitigation measures which should be implemented to further reduce impacts to visual resources. The BLM can impose the following mitigation measures as long as they are not on private or state lands. Adoption of measures on private or state lands would be required by other governmental entities or would be strictly voluntary on the part of the operator.

Visual Mitigation Opportunity 1. The operators and BLM should investigate whether the use of surface gathering pipe in the Sensitive Viewshed SRMZ would reduce visual impacts. Surface pipelines are used elsewhere in the Green River Basin and can dramatically reduce surface disturbing impacts (from buried pipeline scars) and rights-of-way clearing. Surface pipelines would be particularly important in areas where pipelines do not follow road rights-of-way.

Visual Mitigation Opportunity 2. One way to avoid visual impacts associated with construction of well pads, roads and pipelines would be to avoid any activities on the sensitive soils shown on Figure 3-15. Locating well pads on sensitive soils or slopes greater

than 15 percent would increase the total amount of disturbance because larger areas would be needed to accommodate the well pad, road or pipeline. Furthermore, disturbed sensitive soils could be difficult to reclaim because topsoil is limiting, effective moisture is low and erosion is high. The badland soils in the Blue Rim Area of the PAPA are unique landform features that provide character to the landscape and, if disturbed, could not be reclaimed to their original form. Well pads, roads and pipelines should not be placed on these soils.

Visual Mitigation Opportunity 3. To avoid the introduction of new, linear visual intrusions on the landscape, new road and pipeline corridors should follow existing two-tracks where they lend themselves to proper road design and location criteria. New roads and pipeline corridors should follow contours and use topography as screening. New pipelines should be combined with existing or proposed roads and new cross-county pipeline corridors should be avoided, wherever possible.

Visual Mitigation Opportunity 4. Production facilities should be placed away from the edge of the Mesa regardless of VRM class to prevent the facilities from being silhouetted on the skyline. Silhouetted structures are more likely to draw the attention of a casual observer. Low profile tanks could be used to reduce silhouetted tanks. Low profile tanks could be considered in VRM Class III areas to partially retain the existing character of the landscape.

Visual Mitigation Opportunity 5. If BLM allows a well pad to be developed in any of the VRM Class II areas, roads and well pads may need to be surfaced with materials that reduce visual contrast. For example, in the VRM Class II area near Pinedale, the subsoil material (Wasatch Formation) can be very light in color and would contrast with surrounding undisturbed areas. Mixing topsoil with gravel (1 inch deep) in highly visible areas would reduce contrast. To observe this contrast, look at the Mesa Road from any location south of Pinedale. This contrast attracts attention to the disturbance. Opportunities to surface roads and well pads with materials closer in color and texture to the surrounding landscape should be investigated by the operators.

Visual Mitigation Opportunity 6. During drilling, lights on rigs should be shrouded and directed onto the drilling platform or floor so that lights and glare are not directed away from the drilling area. This will

minimize night lighting effects and impacts to visual and recreation resources. Night lighting effects can diminish the feeling of solitude beyond the project area boundaries.

Visual Mitigation Opportunity 7. The glare from solar panels installed on production facilities is especially noticeable. As more producing locations are installed in the project area, glare will become more obvious. The operators should evaluate placement of the solar panels on each producing location (such as behind tanks) to determine where placement will be the least noticeable.

Visual Mitigation Opportunity 8. BLM could solicit public input during APD review for wells located in the Sensitive Viewshed SRMZ. BLM should consider not reissuing expired leases in this SRMZ.

Visual Mitigation Opportunity 9. If centralized production facilities are utilized, visual impacts could be reduced if the roads that are constructed to the well locations are constructed at a standard intended for their long-term use. This standard would consider that heavy equipment traffic would only be required during drilling and only at other limited times during the life of the well, such as during work-overs. Daily visits to the well location would not be required. Ensuring that the smallest possible road disturbances occur will be critical to minimize visual impacts. Any road designed or constructed to less than a resource road standard would require BLM approval.

Visual Mitigation Opportunity 10. Production equipment on private lands and minerals within the project area should be painted with the same earth tone colors utilized on Federal lands and minerals to prevent visual contrasts and to blend these facilities into the landscape as much as possible.

Visual Mitigation Opportunity 11. BP Amoco's Field Office would be painted a BLM approved earthtone color in accordance with Appendix A.

Visual Mitigation Opportunity 12. Where flares or combustion chambers are required in the Sensitive Viewshed SRMZ, they should be located such that their visual impact is minimized.

Visual Mitigation Opportunity 13. BLM should investigate the technical and economic feasibility of limiting the number of well pads in the Sensitive Viewshed SRMZ to less than 4 pads/section. It is

understood that less than 4 pads/section may result in lost opportunities to completely recover the gas resource and could be contrary to the rights conveyed to the lessee.

Visual Mitigation Opportunity 14. To ensure visual protection within the sensitive viewshed and VRM Class II and III areas, BLM should implement its visual contrast rating process for each APD and right-of-way application. This would help determine mitigation options to comply with visual classification objectives.

4.9 Cultural and Historic Resources

4.9.1 Scoping Issues. Some issues regarding cultural and historical resources raised during scoping were from agencies responsible for historic preservation compliance on Federal land and under Federal authority. Others were submitted verbally by the public to BLM's cultural resource specialist and other staff. Finally, field visits among BLM, the Wyoming SHPO, Native Americans, representatives of the Oregon-California Trails Association and others resulted in identification of several cultural resource issues. A summary of comments is provided below:

1. Address impacts to prehistoric and historic resources.
2. Address impacts to the National Historic Trail System.
3. Address impacts to sites sensitive to Native Americans.
4. Block inventory should be conducted.
5. No development should occur in areas with significant cultural, Native American, and historic resources.
6. Native American issues and concerns.
7. Management of cultural resources should occur pursuant to a Programmatic Agreement among the operators, the BLM and interested parties.
8. Public educational efforts should be part of the development proposed.
9. People want a chance to visit "digs" when they occur.
10. Sites discovered during earthmoving projects are a management concern.
11. Vandalism is a concern.

4.9.2 Significance Criteria. A significant impact to cultural or historical resources, as defined by 36 CFR 800.5 (July, 1999 version) would include:

- An undertaking that alters, directly or indirectly, characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property's eligibility for the National Register. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative.
- Adverse effects on historic properties include, but are not limited to: (i) physical destruction of or damage to all or part of the property; (ii) alteration of a property, including restoration, rehabilitation, repair, maintenance, and stabilization; (iii) removal of the property from its historic location; (iv) change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance; and (v) introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features.

4.9.3 Alternative Impacts

4.9.3.1 Summary of Impacts Common to All Alternatives (Except the No Action Exploration/Development Scenario). Under the SS Alternative, no restrictions would be placed on non-Federal lands and minerals to protect cultural properties and Native American sites. On Federal lands, any undertaking by operators would follow the BLM National Programmatic Agreement Process, as identified in BLM's State Protocol Agreement between BLM and the Wyoming SHPO, prior to any surface-disturbing activity and would either avoid or protect cultural resource properties and sacred sites. The preferred strategy for treating potential adverse effects on cultural properties will be "avoidance". If avoidance is imprudent or unfeasible, appropriate mitigation may include excavation (data recovery), stabilization, monitoring, protection barriers and signs, Native American consultation, archival or ethnographic studies, or other physical and administrative measures. Traditional elders would be consulted regarding the importance of specific features identified, and for their recommendations on appropriate avoidance distances. Avoidance distances would depend on the importance of the

features involved and their topographic setting as well as the technical and economic feasibility of meeting the rights of the mineral lessee. Viewshed (vista) and noise analysis may be conducted to help determine appropriate avoidance distances.

Under the RP Alternative on Federal Lands and Minerals, the project would be managed in accordance with an Agreement Document - groups of actions or undertakings and groups of sites or site types would be managed holistically, precluding site specific consultation or repetitious mitigation. Mitigation measures would be implemented according to a mitigation plan reviewed as part of Section 106 consultation for National Register eligible or listed properties. Avoidance distances for sacred sites would range from 100 feet to 1 mile depending on the importance of the features involved and their topographic setting as well as the technical and economic feasibility of meeting the rights of the mineral lessee.

Because of the requirement for compliance with Section 106 of the National Historic Preservation Act (NHPA) and with the Archeological Resources Protection Act (ARPA), all areas on Federal lands and minerals proposed for surface disturbance would be surveyed for cultural resources. Procedures for identifying and protecting cultural resources on private or State of Wyoming lands are not in place. Only if a project involves a Federal permit or authorization (e.g., a pipeline crossing on both BLM and private land), would Federal historic preservation requirements apply.

While inventory, evaluation and avoidance strategies will insure no effect to significant cultural resources recognized and located during standard pedestrian inventory on Federal lands and minerals, sites not so recognized could be damaged or destroyed. Such unexpected discoveries would be handled on a case-by-case basis pursuant to treatment or discovery plans or programmatic agreements pursuant to 36 CFR 800.13. Consultation involves the applicant, the Wyoming State Historic Preservation Office (SHPO), the Advisory Council on Historic Preservation, and interested parties. A Draft Programmatic Agreement with various Treatment and Management Plans is presented in the Cultural Technical Report.

Unexpected discoveries involve the non-predicted location of and impact to cultural resources (predominantly archaeological resources), usually

occurring during initial heavy equipment surface disturbance activity. Such discoveries can become difficult to manage, as time constraints, degree of impact, legally required consultation, cost factors, and a poorly understood resource contribute to a complicated situation. Several past energy development projects in the Pinedale Anticline and Jonah II Field have encountered unexpected discoveries. Unexpected discoveries become problems only if adequate protection plans are not in place.

Occurrence of unexpected discoveries is heightened in newer development areas, where knowledge of soils and geomorphology is limited. This, coupled with a poor understanding of the nature and presence of undetected cultural material and overall buried site potential, contributes to the frequency and severity of encountering unexpected discoveries.

Field techniques likely to minimize discoveries include evaluative testing in "non-site" sensitive soil areas; use of remote sensing techniques such as a magnetometer survey, soil resistivity, or ground-penetrating radar; traditional subsurface hand evaluations; and construction monitoring. In the past, magnetometer inventory, monitoring of construction, and open pipeline trench inspections were the primary tools used to locate unexpected sites. Programmatic agreements and treatment or discovery plans can direct the specific management of affected cultural resources, reducing consultation time frames, expediting management decisions and development, and adequately assuring the appropriate management of affected sites.

Native American traditional cultural properties (TCPs) and sensitive sites are managed subsequent to consultation among BLM, the potentially affected tribal representatives, SHPO, operators, and other interested parties. A number of important TCPs have been identified in the PAPA. Consequently, in accordance with recommendations from the Wyoming SHPO, BLM would require the operators to complete an ethnohistoric study of the entire project area within one year of the issuance of the ROD for this project. This study would identify important Native American cultural, religious and traditional use areas, historic sites, trails, wagon routes and other sensitive cultural locales in the project area.

The proposed project could increase the potential for damage to cultural resources by illegal artifact

collecting due to increased human presence. This presence is exacerbated by increased road construction, oil field and ancillary activity, and ease of access to and within the project area. It was recommended in Section 4.5.4 of this EIS that oil and gas roads, where practicable, be gated and locked to protect sensitive resources. BLM would implement this measure to protect cultural resources, where necessary.

Conflicts with the Rock Springs to New Fork Wagon Road and other historic properties may develop (see Figure 3-12). However, unlike the Oregon Trail system routes (i.e., routes where visual and other impacts are restricted within a 0.25 mile protective corridor), this Expansion Era wagon road is considered less sensitive and BLM has not adopted restrictions in close proximity to these wagon roads. Historic properties, such as homesteads and other buildings, are located on private lands in the project area. They could be impacted by project activities. Likewise, impact to the traditional historical/cultural landscape would occur, as many of the features associated with the landscape are located on private lands.

Generally, the types of impacts described above would occur for all alternatives except for the No Action Exploration/Development Scenario. However, because the well density would be reduced, less impacts are likely to occur to cultural and historic properties with either RP alternative than with the SS Alternative. However, it is impossible to quantify the reduction in the number of sites potentially affected by any of the alternatives.

Compression. All of Jonah Gas' proposed compressor station sites are located outside of the Lander Trail SRMZ. Western Gas's proposed site in Section 3, T. 31 N., R. 109 W. is also outside the SRMZ, however, Western Gas' proposed site located in Section 36, T. 30 N., R. 108 W. is within the SRMZ and may be visible from the centerline of the trail. It is approximately 1.9 miles south of the trail and located on the south side of State Highway 351. Therefore, potential impacts to the SRMZ would be minimized. Ultra's proposed site located in Section 16 T. 31 N., R. 108 W. is approximately 1.9 miles north of the trail within the SRMZ and would likely be visible from the trail. Painting with an earthtone color would help minimize impacts to the SRMZ.

Sales Pipeline. The sales pipeline would be constructed in an existing pipeline corridor and would

not affect any known or significant cultural resources. However, the pipeline would cross areas that have a moderate potential for encountering buried cultural materials. The BLM would require class III inventories and/or monitoring along the alignment, where there is a potential to impact these resources.

The sales pipeline would cross historic trails (Pony Express Route, Oregon Trail, and the Sublette, Slate Creek and Kinney Cutoffs) at non-contributing portions of the overall trail system, therefore, no adverse effects to the trail variants are anticipated. Historic trail segments would not be used by operators or their contractors to access the pipeline right-of-way. In addition, no adverse impacts are anticipated to occur to known Native American sites of religious or cultural significance (BLM, 1998a).

BP Amoco Field Office. The construction of the BP Amoco Field Office (disturbance of 5 acres) would not affect any known cultural resources.

Lander Trail. The remainder of this section will focus on impacts to the Lander Trail. Potential impacts to the trail are very different for each of the alternatives. The management objective for the Lander Trail SRMZ (see Figure 3-11) for each of the alternatives is listed on Table 2-8 and described below:

SS Alternative. Currently, the BLM imposes the following controlled surface occupancy stipulations for leases in the vicinity of the Lander Trail "surface occupancy or use within the visual horizon or 1/4 mile (whichever is closer) of the Lander Trail will be restricted or prohibited unless the operator and surface managing agency arrive at an acceptable plan for mitigation of anticipated impacts." Under this alternative there would be no further standardized restrictions to development in close proximity to the trail.

RP Alternative on Federal Lands and Minerals. One of the concerns expressed by the agencies responsible for managing the Lander Trail was that restricting development to only 0.25 miles may protect the surface of the trail but it would do little to protect the trail's setting. This alternative would impose additional buffers adjacent to the trail. The 0.25 mile wide buffer which avoids surface disturbance would still be imposed. In addition, BLM would make every effort to locate wells between 0.25 and 1.5 miles of the Lander Trail and north of State Highway 351 in areas not visible from the trail and would not allow more than 2 visible well pads/section, where possible.

However, more than 2 visible well pads may be allowed if centralized production facilities are constructed that are not visible and eliminate the need for tanks at the visible locations. Between 1.5 and 3 miles from the trail and north of State Highway 351, no more than 8 well pads/section would be allowed. Additionally, all related surface disturbance (access roads, pipelines, staging areas, etc.) would be carefully planned and implemented to eliminate or reduce visual impacts to the historic trail setting. These additional protective buffers would be limited only to Federal lands and minerals.

RP Alternative on All Lands and Minerals. This alternative would apply the RP Alternative for Federal Lands and Minerals restrictive buffers (described above) to all lands adjacent to the trail. Applying these restrictions to non-Federal lands/minerals would be voluntary on the part of the operators.

4.9.3.2 Project Wide Exploration Development Scenario. Impacts for the 500 and 700 well pad levels of development would be similar, however, there is greater potential for impacts with the 700 well pad development level due to the additional 200 well pads and associated roads and pipelines.

Standard Stipulations Alternative. This alternative would comply with current lease stipulations and Wyoming BLM's Mitigation Guidelines. However, the alternative would result in significant direct and indirect impacts to the trail. Figure 4-6 shows non-Federal lands near the Lander Trail. It also shows where potential well pad locations could be developed in close proximity to the trail. Section 36 is a state section with state minerals. If this section is developed under any spacing scenario, impacts would occur within the 0.25 mile buffer on either side of the trail. Under the 40-acre well pad spacing scenario, well pads could be located directly adjacent to or over the trail. Obviously, such an impact would result in a significant impact to the Lander Trail. Stipulations on state leases issued for this section do not avoid disturbance of the trail or provide a buffer around the trail.

In addition to the direct impact in Section 36, T. 31 N., R. 109 W., an additional (indirect) impact from development would be expected under this alternative. That indirect impact would affect the setting of the trail. The setting of the trail through the majority of the PAPA is undisturbed and represents the condition of the natural landscape pioneers using

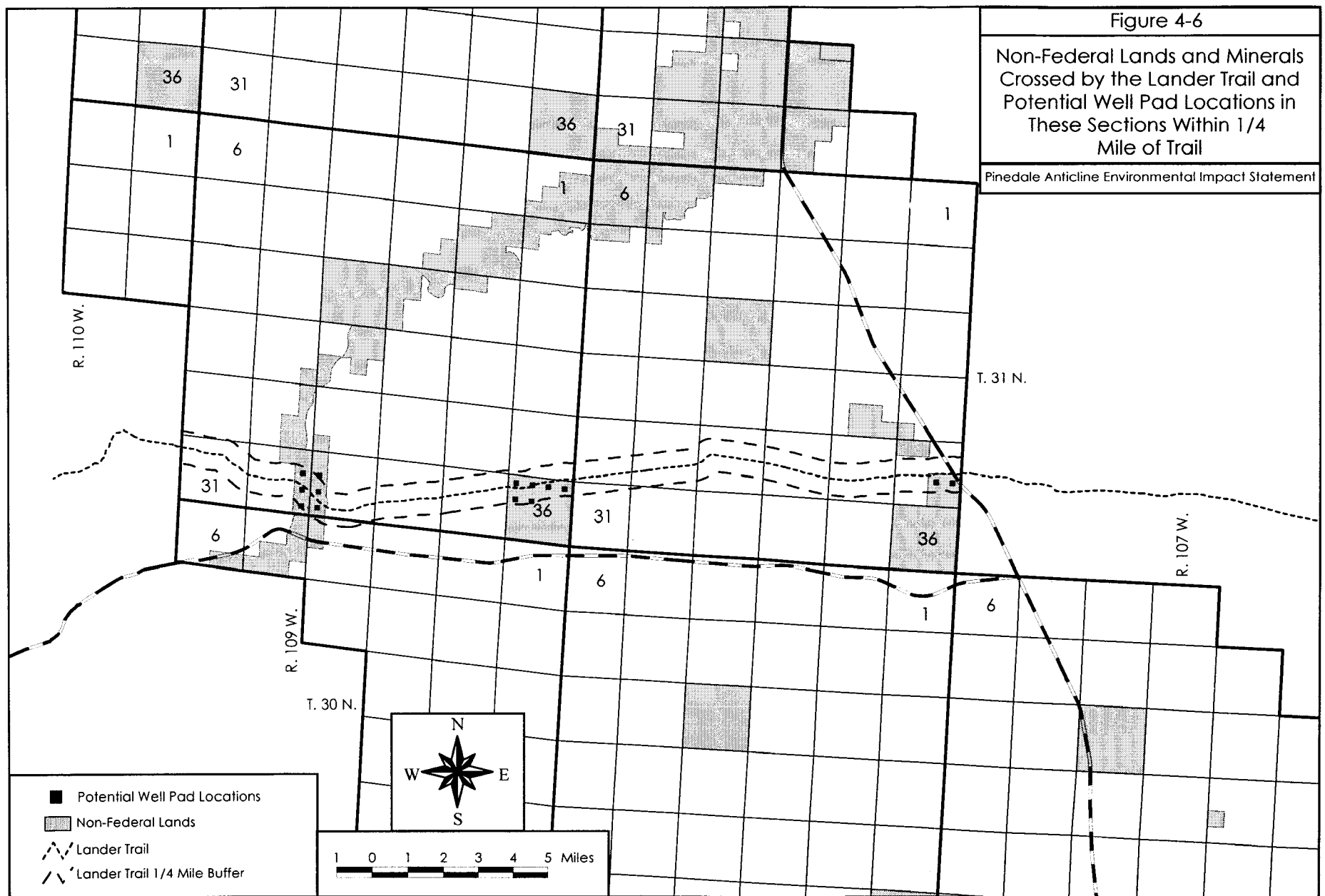
the trail would have experienced. The National Park Service, Long Distance Trail Office (NPS/LDTO), as required by Section 5(f) of the National Trail System Act, has prepared a draft management and use plan EIS for the Oregon National Historic Trail. The NPS/LDTO, in the draft trail management plan, concluded that the trail through the PAPA did not meet the plan's criteria for a "high potential segment".

BLM, who is responsible for managing the trail on Federal lands, does not agree with NPS/LDTO's conclusion regarding the management plan's ranking of the trail through the PAPA.

The viewshed from portions of the trail is extensive. Along segments of the trail in the project area it is possible to see for many miles in all directions. Although State Highway 351 is directly south (between less than one and two miles) of the trail in the project area, topographic relief prevents traffic from being noticeable in most areas. Currently, the view from much of the trail does not include well pads, roads and pipelines. This would change even if development occurs outside the 0.25 mile buffer. The view in many places from the trail may become dominated by production facilities. The area around the trail is designated primarily as VRM Class IV (see Figure 3-9) where modifications to the natural landscape can be apparent. Under this alternative up to 16 well pads/section would be generally allowed outside the 0.25 mile trail buffer. Such well density would significantly alter the setting of the trail.

RP Alternative on Federal Lands and Minerals. Direct impacts to the trail would still occur under this alternative because of the state lands and minerals in Section 36, T. 31 N., R. 109 W. However, a reduction in the potential impacts to the trail's setting would occur by implementing additional well density restrictions on either side of the trail on Federal lands and minerals. The area mitigated for visual impacts under this alternative would not extend south of State Highway 351 because it is assumed that traffic on the highway already represents a significant visual intrusion where it is visible from the trail. Restricting further development activities south of the highway would not be warranted given the noise and visual impacts associated with highway traffic.

In essence, this alternative would reduce the number of visible well pads from a potential high of 16 per/section to 2/section, in most cases. In some areas, 4 well pads/section would be visible because it would be impossible to hide the production facilities



from view due to the lack of topographic relief. These areas are discernable by examining the visibility analysis completed for the trail (see Figure 3-11). Production equipment would be hidden from view in areas between 0.25 and 1.5 miles of the trail. Activities associated with oil and gas development would still be evident, equipment and disturbance would still dominate the landscape but to a much lesser degree than it would under the SS Alternative.

Pad Drilling. Pad drilling would further reduce the amount of disturbance and therefore potential impacts to the Lander Trail.

Centralized Production Facilities. It is anticipated that the use of centralized production facilities would reduce impacts to the Lander Trail. Centralized production facilities hidden from view would eliminate the need for tanks at the well locations. However, significant impact to the Lander Trail viewshed would still exist, but the magnitude would be less.

RP Alternative on All Lands and Minerals. This alternative would apply the mitigation measures listed above to all lands throughout the Lander Trail SRMZ. As such, direct impacts to the trail would not occur and the overall setting of the trail would be preserved to the extent possible. It is highly unlikely that the operators would agree to voluntarily implement this alternative.

Pad Drilling. Pad drilling would further reduce the amount of disturbance and therefore potential impacts to the Lander Trail.

Centralized Production Facilities. It is anticipated that the use of centralized production facilities would reduce impacts to the Lander Trail. Centralized production facilities hidden from view would eliminate the need for tanks at the well locations. However, significant impact to the Lander Trail viewshed would still exist, but the magnitude would be less.

4.9.3.3 Anticline Crest Exploration/Development Scenario. All impacts described above would be the same under this scenario as for the Project Wide Scenario except that disturbance in the vicinity of the Lander Trail would be reduced to the anticline crest area.

4.9.3.4 No Action Exploration/Development Scenario. If this alternative is adopted, the impacts to the Lander Trail SRMZ and the other

cultural and historical values in the project area would not occur.

4.9.4 Additional Mitigation Opportunities. There are several mitigation measures which should be implemented to further reduce impacts to cultural/historical resources. The BLM can impose the following mitigation measures as long as they are not on private or state lands. Adoption of measures on private or state lands would be required by other governmental entities or would be strictly voluntary on the part of the operator.

Cultural/Historical Mitigation Opportunity 1. The only direct impact to the Lander Trail would occur in Section 36, T. 31 N., R. 109 W. This state section could be developed at up to 16 well pads/section and direct impacts to the trail could occur because the state leases do not contain stipulations which offer protection for the trail. The BLM and the State of Wyoming should investigate a land and mineral exchange for this section. As of this date no development has occurred within this section. By obtaining the surface rights, the BLM could offer some protection of the trail from direct impacts, although the existing rights of the current lessee would need to be recognized. The state could replace any potential lost revenue from this section by obtaining a Federal section of equal mineral potential (perhaps on the crest of the anticline). Such an exchange is presented herein as a mitigation opportunity.

Cultural/Historical Mitigation Opportunity 2. The BLM has initiated consultation with Native American tribes regarding Traditional Cultural Properties (TCPs) in the project area. The Shoshone and especially the Utes would like to enter into an agreement with the BLM and the operators to manage sites, but more importantly, the area more holistically. Native American interests go beyond the visual view of "sites" and "buffers" to a desire to manage the landscape as an integrated, interconnected unit. Thus, development of a Native American Interests Management Plan for the project area (understood to be the larger exploratory drilling area, not restricted to the Pinedale Anticline area) is a mitigation opportunity. Benefits to be derived from this approach include avoiding the pitfalls of project-specific consultation on site specific conflicts and managing for Native American interests proactively, ahead of pending developments. Partners to this type of approach include not only the operator/leasees, but

also area ranchers, environmental groups, the public and BLM.

Cultural/Historical Mitigation Opportunity 3. The operators and BLM should initiate an educational program to inform employees and visitors about regulations concerning cultural resource management and artifact collection. Interpretive and informative signing could be implemented at the major road access points entering the project area.

Cultural/Historical Mitigation Opportunity 4. The selective use of locked gates, where practicable, could be used to protect any significant sites found during inventories. This approach is more commonly used as a seasonal restriction to protect wildlife during winter months, but some applications may present themselves from a cultural resources standpoint. It is not considered to be a "standard mitigation" for cultural sites.

Cultural/Historical Mitigation Opportunity 5. The project will undoubtedly generate a substantial amount of information concerning the archaeology, history and traditional use of the study area. Much of this information is presented in the form of technical reports unintelligible to the layperson, with site locational information proprietary. These could include preparation of a series of annual reports available for dissemination to the general public that inform people about what kinds of sites have been investigated, why they are important, the direction research is going and opportunities for public participation. Viewing sites during excavation as well as hands-on volunteer efforts should be encouraged. Finally, BLM should commit to an annual public presentation concerning the overall cultural resources program within the PAPA.

Cultural/Historical Mitigation Opportunity 6. To direct and make more efficient use of cultural resource investigations in the project area, a Programmatic Agreement is needed. Various treatment plans (for the Lander Trail, for discovered sites) would be part of this Programmatic Agreement. A draft of these documents is presented in the Cultural Resources Technical Report.

4.10 Air Quality and Noise

4.10.1 Scoping Issues. Air quality-related concerns have been heightened in southwest Wyoming in recent years. Because of this

awareness, a number of comments were received during scoping. They are summarized below:

1. Concerned about impacts from fine particulate dust.
2. Don't want to see puffs of smoke that are currently occurring in Jonah.
3. Operators should use state-of-the-art pollution control technology.
4. Consider using natural-gas fired rigs rather than diesel.
5. Consider using solar electric compression.
6. Additional air quality monitoring is necessary and should be installed by the operators.
7. Operators are failing to submit Notices of Installation.
8. Concerned about the potential impacts of atmospheric pollution on National Forest System lands downwind of the proposed development.
9. Concerned with the potential reduction in visual quality and acidification of high mountain lakes within the Class I airsheds of the Bridger and Fitzpatrick wilderness areas and the Class II airsheds of the Popo Agie Wilderness Area and Wind River Indian Reservation Roadless Area.
10. Concerned with the proximity of the development to the Class I airsheds. Development is already within 30 air miles of the Class I areas. This does not allow for settling or dispersion of emissions and may lead to increased deposition in the Class I areas.
11. Numerous lakes within the Bridger and Popo Agie wilderness areas need to be protected from acidification.
12. Use electricity (cooperative, centralized, buried) to run the equipment at each well.
13. Prohibit venting to the atmosphere from wells.
14. Mandate the use of electrical compression in place of natural gas-fired equipment to eliminate NO_x, CO, VOC and PM.
15. Use BACT to limit exhaust emissions and mandatory compliance testing at regular intervals should be done by independent third parties.
16. Require MACT for hazardous air pollutants at all production facilities.
17. Require the installation of flares at all well locations or at centralized production facilities to destroy VOCs and hazardous air pollutants.
18. Atmospheric venting should be controlled by vapor recovery systems to eliminate VOCs and other hazardous air pollutants.
19. Install and maintain equipment to measure NO_x, CO, HAPs, BTEX, visibility, acid rain, PM, and VOC emissions.

20. Use natural gas as a fuel for trucks to reduce emissions.
21. Address the adverse impacts to air quality from burning substitute fuel sources associated with delaying development in the project area.
22. Noise impacts from the project will be "a major problem".
23. What can be done to decrease noise from drilling?
24. Can noise be limited to certain times of the day?

4.10.2 Significance Criteria Significant impacts to air quality and noise would result from project-related activities if it is demonstrated that:

- PSD increments for Class I and Class II areas have been exceeded; or
- National Ambient Air Quality Standards (NAAQS) or Wyoming Ambient Air Quality Standards (WAAQS) have been exceeded; or
- increased toxin concentrations are above designated thresholds; or
- lifetime incremental increase in cancer risk of one additional person in one million from the most likely exposure scenario is exceeded; or
- visibility impacts to sensitive areas are above the designated 0.5 and 1.0 dv (deciview) change threshold;
- change in sensitive lake acid neutralizing capacity (ANC) is above the designated 10 percent level of acceptable change (LAC); or
- noise levels are increased more than 10 dBA at any noise sensitive area (residences and sage grouse leks).

4.10.3 Alternative Impacts

4.10.3.1 Summary of Impacts Common to All Alternatives (Except the No Action Exploration/Development Scenario). An Air Quality Assessment Protocol was developed which proposed the methodologies for quantifying potential air quality impacts from the project and surrounding development. The criteria for evaluating the significance of the potential air quality impacts was also addressed. The protocol was prepared with input and review from the BLM, State of Wyoming, USFS, EPA Region VIII, NPS and the operators, thereby ensuring that the assessment methodology is acceptable to the Federal land managers.

Impacts were analyzed for the Project Wide and Anticline Crest scenarios for both 500 and 700

producing wells. They were also analyzed for three compressor engine NO_x emission rates (1.5, 1.0 and 0.7 g/hp-hr) and for three compressor station locations (slightly southeast of the centroid of the PAPA, slightly northwest of the centroid of the PAPA and immediately south of the PAPA, see Figure 2-10). This results in a combination of 36 potential scenarios which were analyzed. Representative results and generally the case with the most impact is presented in each section below, however, the results of all scenarios and alternatives analyzed are presented in the Air Quality Technical Report. Presented here are the results for the Project Wide Scenario, 700 producing wells, compressor engine NO_x emission rate of 1.5 g/hp-hr and compressor station location C1 (slightly southeast of the centroid of the PAPA).

Air Emissions Inventory. An air emissions inventory was developed for sources directly associated with the Pinedale Anticline Project. The inventory was developed based on emissions inventories for similar sources in Wyoming (e.g., Jonah II Field, Moxa Arch and Fontenelle). Emissions inventories were developed for regulated pollutants (e.g., NO_x, SO_x, CO, PM₁₀, PM_{2.5}, and VOCs) and hazardous air pollutants (HAPs). For this analysis, the HAPs consist of xylene, benzene, toluene, ethylbenzene, n-hexane, and formaldehyde. Emissions sources expected to be part of the Pinedale Anticline Project include:

- construction emissions, including well pad and resource road construction, drilling, and well completion and testing;
- production emissions, including well operation;
- wind erosion; and
- compression.

Construction Emissions. Air emissions result from three sequential construction activities: well pad and resource road construction, well drilling and well completion. Emissions for both regulated pollutants and HAPs were estimated for each activity, when applicable. Well pad and resource road construction consists of clearing, grading, and constructing the road and pad. The emissions sources affiliated with this activity include fugitive dust emissions from travel on unpaved roads, heavy construction operations, and tailpipe emissions from mobile sources used in the construction process. It was assumed that controls for these sources would include watering on the well pad and service roads during well pad and resource road construction to control emissions of

particulate matter. The watering control efficiency was assumed to be 50 percent.

Well drilling consists of rigging-up, drilling, and rigging-down. The emissions sources affiliated with well drilling include fugitive dust emissions from travel on unpaved roads, and tailpipe emissions from mobile sources such as heavy duty diesel engine powered trucks and drill rigs used in the drilling process. Particulate matter is assumed to be controlled by watering the unpaved roads, with a control efficiency of 50 percent.

Well completion also includes well testing. The emission sources affiliated with well completion include fugitive dust emissions from travel on unpaved roads, tailpipe emissions from mobile sources and flaring of natural gas for well evaluation.

Particulate matter is assumed to be controlled by watering the unpaved roads, with a control efficiency of 50 percent.

Both short-term (maximum) and long-term (annual) emissions were estimated for construction emissions. For the short-term emissions, it was assumed that a maximum of 8 wells could be under construction at any one time. For the estimation of the long-term emissions, it was assumed that a maximum of 90 wells would be constructed during any one year. Further discussion on assumptions for estimation of construction emissions are provided in the Air Quality Technical Report.

Concern has been expressed over the possibility of visual plumes from well construction equipment in the vicinity of Pinedale. The same drilling equipment would be used as is used throughout southwestern Wyoming, namely diesel engines. The diesel engines on the rigs can produce a distinct, visible, exhaust plume. Under good dispersion conditions, (i.e., daytime and/or windy), the plume will disperse over a very short distance. However, under poor dispersion conditions (i.e., during an inversion - usually occurring during nighttime and early morning hours, and especially during the winter months), the plume can remain close to the ground, drift horizontally, and be visible for several hundred feet. Depending on the lighting conditions, especially if the plume is between the viewer and the sun, it can be highly visible over this distance.

Well Production Emissions. Air emissions result from several aspects of gas production: three-phase separation, triethylene glycol (TEG) de-

hydration, and condensate storage. Emissions of both regulated pollutants and HAPs were estimated from each process, when applicable.

A natural gas-fired three-phase separator heater would operate for a maximum of 15 minutes per hour and only during the winter months (October 1 through April 30). The glycol heater is assumed to operate year-round for a maximum of 15 minutes per hour. The operation of a three-phase separator results in VOC and HAPs emissions from flashing. The operation of a TEG dehydration system also results in emissions of VOCs and HAPs that were stripped from the gas during dehydration. These emissions are released through a separate stack during regeneration of the glycol (i.e., evaporation of adsorbed water).

VOCs and HAPs emissions from the glycol dehydration system were estimated using the Gas Research Institute's GLYCALC emissions estimation program. For this study, predicted emissions from a typical Jonah II well (provided by McMurry Oil Company) were adjusted by the ratio of the desired Pinedale Anticline gas production rate per well to the Jonah II production rate. VOCs and HAPs emissions from dehydration were calculated based on the total well field production rates. It was assumed that no controls would be required on these emissions sources.

Flashing emissions occur as a result of pressure differentials between the well and the separator, and the separator and the storage tank. For the purposes of this analysis, all flashing emissions are assumed to occur at the separator, where the largest pressure difference is realized. The flashing emissions of VOCs and HAPs from the condensate storage tanks were estimated based on HYSYS simulations of a typical Jonah II well. Predicted flashing emissions from a typical Jonah II well (provided by McMurry Oil Company) were adjusted by the ratio of the desired Pinedale Anticline gas production rate per well to the Jonah II production rate.

A percentage of the wells would be required to apply state-regulated Best Available Control Technology (BACT) on condensate tanks. Typically for condensate tanks requiring BACT, controls for flashing are assumed to be flaring with 98 percent control efficiency. It was assumed that 20 percent of the total condensate would be produced from wells requiring BACT.

Both short-term (maximum) and long-term (annual) emissions were calculated for all of the production source categories. A detailed description of the calculations are provided in the Air Quality Technical Report.

Wind Erosion Emissions. Wind erosion emissions were calculated for disturbed areas, such as the well pads and access roads. The wind erosion emissions calculation was taken from the Jonah II EIS (BLM, 1997a).

Compression Emissions. The emissions from compression were calculated assuming a maximum of 26,000 hp. Application of state-regulated Best Available Control Technology (BACT) would be required on the compressor engines. Compressor engine NO_x emissions were quantified for 1.5, 1.0 and 0.7 g/hp-hr and CO emissions were quantified at 3.0 g/hp-hr. The remaining pollutants were estimated based on AP-42 emission factors. Current control technology typically reduces compressor engine NO_x emissions to 1.5 g/hp-hr or below.

The total estimated emissions for the Project Wide Scenario, 700 producing wells and 26,000 hp compression is provided in Table 4-27. Compressor engine NO_x emissions are provided for 1.5, 1.0 and 0.7 g/hp-hr.

Air Quality Modeling. Three types of modeling (microscale, near-field, and far-field) were used to characterize air quality impacts. Microscale modeling was conducted to predict impacts in the immediate vicinity (e.g., within 650 feet; 1,320 feet for HAPs) of individual sources (i.e., construction of a well) for comparison to the ambient air quality standards. Microscale modeling was also performed to predict hazardous air pollutant impacts at the nearest residence to an individual source (i.e., operation of a well or compressor) for a conservative estimation of the long-term chronic health and carcinogenic effects. Near-field modeling was conducted to predict impacts in the vicinity (on and within approximately 3 miles of the PAPA) of the Pinedale Anticline Project sources (i.e., construction and operation of wells, and operation of the compression facilities) for comparison to the ambient air quality standards. Far-field modeling was used to predict impacts to air quality and Air Quality Related Values (visibility and acid deposition) at nearby (i.e., farther than 3 miles of the PAPA) sensitive Class I and Class II areas from the Pinedale Anticline Project sources.

Microscale Modeling. The emissions of regulated pollutants are negligible during well operation, so the analysis of impacts from well construction represents the maximum impact scenario near the well. Both emissions and impacts of the regulated pollutants associated with the construction of each well will be essentially the same as that for the Jonah II Project. Emissions and impacts from the Jonah II Project have been defined in great detail (BLM, 1997a). The Jonah II analysis estimated the impacts on a grid of receptors surrounding a typical well beginning 650 feet from the well. This distance is also a reasonable representation of the distance from a well to the nearest public access location during the construction phase of the Pinedale Anticline Project. Therefore, the maximum impacts presented in the Jonah II analysis (summarized in Table 4-28) are expected to be representative of the maximum expected impacts from the Pinedale Anticline Project. None of the impacts shown on Table 4-28 exceed the applicable ambient air quality standards.

A HAPs analysis was conducted for the well field due to the potential for wells to be located in close proximity to residences. The long-term (i.e., chronic) health effects from air emissions of six toxins were analyzed and include benzene, toluene, ethylbenzene, xylenes, n-hexane, and formaldehyde. Emissions of each of these hazardous air pollutants were analyzed for their impact on chronic health, and emissions from two of the pollutants (benzene and formaldehyde) were analyzed for their carcinogenic effects. USEPA's ISCST3 dispersion model was used to determine the long-term chronic impacts from toxic emissions on receptors in the vicinity of the wells and at locations of possible residences. This is representative of a well or well cluster being located as close as 350 feet from a residence. The modeling results indicate that the pollutant concentrations for each of the six toxins are below the chronic exposure thresholds, and therefore are expected to have no chronic health impacts. As the distance from a well to a residence increases, the impacts decrease. A discussion of the basis for the threshold determination is provided in the Air Quality Technical Report.

The compressors consist of internal combustion engines fired by natural gas and are expected to be essentially the same in design as the compressor stations proposed for the Jonah II Project. HAPs impacts are judged in relation to the residence, and the distances from the Pinedale Anticline proposed compressor stations to the nearest residence are at

Table 4-27 Total Long-Term (Annual) Pinedale Anticline Project Emissions (tons/year)					
Pollutant	Construction	Production	Erosion	Compression (26,000 hp)	Total
				376.59 (1.5 g/hp-hr) 251.06 (1.0 g/hp-hr) 175.74 (0.7 g/hp-hr)	693.5 568.0 492.7
NO _x	272.18	44.76	-		
CO	346.46	44.76	-	753.19	1,144.4
VOCs	63.94	7,129.76	-	78.58	7,272.3
SO ₂	4.85	0.26	-	0.48	5.6
PM ₁₀	243.74	3.53	84.77	25.05	357.1
PM _{2.5}	58.02	3.53	33.91	25.05	120.5
Benzene	0.001	239.45	-	0.76	240.2
Toluene	0.002	580.37	-	0.22	580.6
Xylenes	-	495.47	-	0.05	495.5
Ethylbenzene	-	39.68	-	0.04	39.7
n-Hexane	1.22	267.92	-	0.68	269.8
Formaldehyde	4.21	0.03	-	37.58	41.8
The emissions estimates assume the 90 well are drilled and 700 well are operated during the representative year.					

Table 4-28 Ambient Air Quality Standard Impacts Adjacent to a Single Well for the Pinedale Anticline Project (ug/m ³)				
Pollutant	Averaging Time	Impact Plus Monitored Back-ground	WAAQS	NAAQS
SO ₂	Annual	11	60	80
SO ₂	24-hour	57	260	365
SO ₂	3-hour	172	1,300	1,300
PM ₁₀	Annual	20	50	50
PM ₁₀	24-hour	77	150	150
NO ₂	Annual	22	100	100
CO	1-hour	301	40,000	40,000
CO	8-hour	247	10,000	10,000
BLM, 1998e				

least as far as assumed for the Jonah II analysis (i.e., 4 miles). The HAPs impacts predicted from the Jonah II Project compressor stations are representative of the impacts (on an impact per unit of HAPs emissions basis) for the Pinedale Anticline Project.

Incremental risk increase from exposure to carcinogenic toxins is generally presented in the form of expected additional cases of cancer per million persons exposed to the toxins. The calculation is made for two exposure scenarios, which are: maximum exposure and most likely exposure. The

first assumes a person is exposed to the substance continually (24-hours per day, 365 days per year, for life of the project which in this case is 30 years), normally an unrealistic exposure. The second assumes exposure for slightly less than 16 hours per day, 7 days per week at full toxin concentration and the remainder at one quarter of that concentration, for 9 years, defined in EPA literature as a realistic estimate of length of residence.

Regarding incremental cancer risk from exposure to well field emissions, even at 350 feet from the nearest well, the formaldehyde impacts are well below the designated threshold level of 1 in one million for both maximum and most likely exposure scenarios (see Table 4-29). However, the incremental risk increase from exposure to benzene at 350 feet from the nearest well is above the designated threshold of 1 in one million for both the maximum exposure and most likely exposure scenarios (an additional 6.4 and 1.4 people per million, respectively). Therefore, significant impacts may result based on the significance criteria described above. At a distance of 1,320 feet from a well, only the incremental risk increase from the maximum exposure scenario is over the designated threshold level at an additional 2.6 people per million, however, significant impacts would not result because it is for the maximum exposure level (not likely to occur). At 1,320 feet, the incremental risk increase for the most likely exposure scenario is below the

designated threshold level at an additional 0.6 people per million.

For the compressor internal combustion engines, formaldehyde is the only HAP of consequence (see Table 4-29). For the 12,000 horsepower compressors assumed for the Jonah II Project, the estimated formaldehyde emissions (21.1 tons per year) resulted in a predicted impact of $0.34 \text{ } \mu\text{g}/\text{m}^3$. Therefore, the formaldehyde emissions from the 26,000 horsepower compressor stations proposed for the Pinedale Anticline Project (37.6 tons per year) would result in an impact of $0.61 \text{ } \mu\text{g}/\text{m}^3$. This impact equates to cancer risks of an additional 3.4 people per million and an additional 0.8 people per million for the maximum exposure and the most likely exposure scenarios, respectively, over the life of the project. The maximum exposure risk of 3.4 additional people per million is above the designated threshold (1 additional person in one million), however, significant impacts would not result because it is for the maximum exposure scenario which is unlikely to occur.

A set of VOC/ NO_x screening tables (Scheffe, 1988) developed by EPA were used to assess the potential for the Pinedale Anticline Project sources to cause an ozone problem in the area. Ozone is formed in the atmosphere through a series of complex nonlinear chemical reactions involving NO_x , VOC and sunlight. The screening tables were developed using the Reactive Plume Model (Morris et al., 1992) under worse case conditions (i.e., highest ozone formation potential conditions). The screening tables provide an estimate of the maximum potential incremental ozone concentration that could possibly occur due to emissions from the new sources. The maximum potential ozone increment is then added to the current existing maximum background ozone concentrations and compared with the ozone standard to determine whether there is a potential for the new sources to cause a violation of the ozone standard. As was done in the Jonah II EIS ozone impact assessment (BLM, 1997a), the EPA VOC/ NO_x point source screening method is applied "using a reasonable, but conservative patch of nine wells". To make sure these impacts are conservative (i.e., overstated), it was assumed that the compressors are included within the patch of nine producing wells. The current maximum 8-hour ozone background is $130 \text{ } \mu\text{g}/\text{m}^3$. Thus, a conservative estimate of the maximum potential 8-hour ozone concentration due to the PAP emissions and background is $159 \text{ } \mu\text{g}/\text{m}^3$, which is below the 8-hour ozone standard of 160

$\mu\text{g}/\text{m}^3$. However, because of the conservatism of the estimates it is not expected that any violations of the ozone standards would occur.

There are several reasons why the ozone calculations are highly conservative: (1) the VOC/ NO_x screening tables were designed to estimate the maximum ozone increment from a point source which occurs under background and meteorological conditions far different than what occurs in southwestern Wyoming; (2) the Pinedale Anticline maximum potential hourly VOC emissions were used in the analysis, the actual maximum daily emissions would be much lower; and (3) the patch of 9 operating wells with compressors were treated as a point source in the analysis when in reality their emissions would be more spread out.

Near-Field Regulated and PSD Pollutant Ambient Concentrations. An atmospheric dispersion model (CALPUFF) was applied in a near-field mode to estimate short-term (less than or equal to 24-hour) and long-term (annual) regulated pollutant concentrations for comparisons against the NAAQS and WAAQS within the immediate vicinity of the PAPA (on and within approximately 3 miles of the PAPA). The results are also compared to the PSD Class II increments (see Table 4-30).

The maximum predicted concentrations for all PSD pollutants are 1 percent or less of the applicable PSD Class II increments at the near-source receptors in the project area and vicinity (e.g., Pinedale). The estimated maximum near-source 24-hour and 3-hour SO_2 concentrations due to the project maximum hourly emissions sources are less than $1 \text{ } \mu\text{g}/\text{m}^3$. This is well below the 24-hour and 3-hour SO_2 PSD Class II increments of 91 and $512 \text{ } \mu\text{g}/\text{m}^3$, respectively. The maximum estimated PM_{10} 24-hour concentration due to project sources is approximately $6 \text{ } \mu\text{g}/\text{m}^3$, which is below the PSD Class II increment of $30 \text{ } \mu\text{g}/\text{m}^3$. When the maximum estimated concentrations are added to the existing maximum background concentrations, the total estimated concentrations for all regulated pollutants are less than the applicable NAAQS and WAAQS. Therefore, the pollutant concentrations as a result of the Pinedale Anticline Project alone do not exceed either the PSD Class II increments or any air quality standards, either within or in the vicinity of the PAPA (within 3 miles).

Far-Field Regulated and PSD Pollutant Ambient Concentrations. The CALPUFF model

Table 4-29 Increased Risk from Carcinogenic Emissions for the Pinedale Anticline Project						
Hazardous Air Pollutant	Wells - With Residences at a distance of 350 feet		Wells - With Residences at a distance of 1,320 feet		Compressors - With Residences at a distance of 4 miles	
	Maximum Exposure	Most Likely Exposure	Maximum Exposure	Most Likely Exposure	Maximum Exposure	Most Likely Exposure
Benzene	6.4	1.4	2.6	0.6	<0.01	<0.01
Formaldehyde	<0.01	<0.01	<0.01	<0.01	3.4	0.8
Units are number of additional people contracting cancer per one million people exposed over life of project.						

Table 4-30 Comparison of Near-Field Pinedale Anticline Project Air Quality Concentrations with PSD Class II Increments and WAAQS and NAAQS (ug/m ³)							
Pollutant	Averaging Time	Project Sources	Class II PSD Increment	Monitored Background	Project Sources Plus Monitored Background	WAAQS	NAAQS
SO ₂	Annual	0.00	20	9	9	60	80
SO ₂	24-hour	0.04	91	43	43	260	365
SO ₂	3-hour	0.12	512	132	132	1,300	1,300
PM ₁₀	Annual	0.24	17	8	8	50	50
PM ₁₀	24-hour	6.00	30	18	24	150	150
PM _{2.5}	Annual	0.08	N/A	5	5	15	15
PM _{2.5}	24-hour	1.59	N/A	10	12	65	65
NO ₂	Annual	0.16	25	9	9	100	100
CO	1-hour	89.28	N/A	3,500	3,589	40,000	40,000
CO	8-hour	58.77	N/A	1,500	1,559	10,000	10,000
For averaging times of 24 hours or less, maximum hourly emissions were used, for annual averaging times, annual emissions were used. Presented results are for the Project Wide Scenario, 700 producing wells, compressor engine NO _x emissions of 1.5 g/hp-hr, and compressor station location C1. Results for all other scenarios and alternatives are presented in the Air Quality Technical Report. Because the source concentration is sometimes less than 1.0, due to significant figures, they do not show an increase to the monitored background level when added to the monitored background level.							

was also applied to estimate the far-field air quality and Air Quality Related Values impacts from the Pinedale Anticline Project. The far-field modeling estimates the total concentration impacts due to the existing background and project sources. Impacts on air quality were estimated at nearby Class I and Class II areas. The sensitive areas include:

- Bridger Wilderness Area (Class I);
- Fitzpatrick Wilderness Area (Class I);
- Washakie Wilderness Area (Class I);
- Grand Teton National Park (Class I);
- Popo Agie Wilderness Area (Class II); and
- Wind River Indian Reservation Roadless Area (Class II).

The model was used to estimate ambient SO₂, NO₂, PM₁₀ and PM_{2.5} concentrations for comparison with NAAQS, WAAQS, and PSD Class I increments

and to address potential AQRV impacts. The estimated maximum regulated and PSD pollutant concentrations at the Bridger Wilderness Area are provided in Table 4-31. The results provided in Table 4-31 are again, for the case with the most predicted impact (i.e., Project Wide Exploration/Development Scenario, 700 producing wells, compressor engine NO_x emissions of 1.5 g/hp-hr and compressor station location C1). The far-field ambient concentration impact results for all of the project emissions scenarios are provided in the Air Quality Technical Report. The estimated concentrations for all pollutants are less than 1 ug/m³ (for all project scenarios and alternatives), well below the applicable PSD increments. The maximum concentration impacts due to project sources alone tend to occur at the Bridger Wilderness Area and are presented in Table 4-31. Predicted impacts to all sensitive areas are provided in the Air Quality Technical Report.

When the maximum estimated concentrations from project sources are added to the maximum potential background concentrations (which occurred away from the sensitive areas), the estimated total concentrations for all pollutants are less than 20 percent of the NAAQS and WAAQS at the sensitive Class I and II receptor areas. Therefore, the pollutant concentration from Pinedale Anticline Project sources do not exceed either the PSD Class I or Class II increments or any of the ambient air quality standards at the sensitive receptor areas.

Visibility Impacts. The effects of the project emissions on visibility degradation at the sensitive receptor areas was evaluated using the IWAQM/FLAG-recommended method (see the Air Quality Technical Report). In this method, the visibility degradation due to the project sources alone was compared against a background visibility condition based on the mean of the 20 percent cleanest days from a long-term (typically 10 year, however, for this analysis it was reduced to 8 years to avoid double counting for the years 1995 to 1997) record of the IMPROVE aerosol monitoring data. For the sensitive receptor areas studied in this analysis, the Bridger IMPROVE data was used because it is the most representative (see Section 3.11 in Chapter 3).

There are two thresholds of visibility change which are used for reporting purposes: the number of days in which the deciview (dv) change is 1.0 or greater; and the number of days in which the dv change is 0.5 or greater. The USFS uses the 0.5 dv change as a LAC threshold in order to protect visibility in sensitive areas. The 1.0 dv change threshold is used in the Regional Haze Regulations as a small but noticeable change in haziness and has been used by other agencies as a management threshold. The 0.5 dv change and 1.0 dv change thresholds are neither standards nor regulatory limits. Rather, they are used to alert the affected land managers that potential adverse visibility impacts may exist and the land manager may wish to look at the magnitude, duration, frequency, and source of the impacts in more detail in order to make a significance determination. The maximum deciview change due to any of the Pinedale Anticline Project scenarios and alternatives alone is 0.46 dv change at the Bridger Wilderness Area. This was for the Project Wide Scenario, 700 producing wells, compressor engine NO_x emissions of 1.5 g/hp-hr and compressor station location C1. Therefore, for all of the project scenarios and alternatives, the estimated visibility impacts due to the Pinedale

Anticline Project alone do not exceed the management thresholds of 0.5 or 1.0 dv change.

Acid Deposition Impacts. The potential impact of the Pinedale Anticline Project emission sources on acid deposition were analyzed using the Fox (1989) method (see Air Quality Technical Report). This method was used to estimate the potential change in acid neutralizing capacity (ANC) at each of five sensitive lakes (see Table 4-32). This approach uses a very simplistic set of equations to estimate how additions of emissions may change lake ANC from a baseline. This approach assumes that ANC generation is constant, and does not factor in watershed buffering ability, lake flushing time or aquatic ecosystem bio-geochemistry. However, it does provide a conservative estimate of potential of lakes ANC to change.

For lakes with background minimum measured ANC values of 25 $\mu\text{eq/l}$ or greater, the USFS has identified a LAC threshold of 10 percent change. For lakes with a minimum ANC background of less than 25 $\mu\text{eq/l}$, the USFS has identified a LAC threshold of 1 $\mu\text{eq/l}$. The five lakes under study all have minimum ANC values above 25, so the 10 percent change LAC threshold is the relevant threshold in this analysis. The background used for the LAC ANC calculation is the 10 percent most sensitive ANC measured background values at each lake (see Chapter 3, Section 3.11). Table 4-32 provides a summary of the analysis of acid deposition impacts for the Pinedale Anticline Project. The change in ANC at any of the sensitive lakes is less than 1.0 percent, well below the 10 percent LAC threshold. Therefore, all potential changes in lake acidity due to the Pinedale Anticline Project alone do not exceed the NFS LAC threshold.

Noise. Two noise sources were analyzed for potential impacts from the Pinedale Anticline Project, a drill rig and a compressor facility. Predicted noise levels at various distances from the drill rig and the compressor facility are provided in Table 4-33.

Background noise level within the PAPA is assumed to be 39 dBA (see Section 3.11.3). Therefore, noise impact from drill rigs becomes significant (greater than 49 dBA) when the rig is located closer than about 800 feet to a receptor. Noise impact from a compressor station becomes significant when it is located closer than about 2,500 feet to a receptor. All of the potential compressor station sites are greater than 2,500 feet from a residence, therefore there are no significant potential

Table 4-31
Comparison of Far-Field Pinedale Anticline Project Air Quality Concentrations with PSD Class I Increments and WAAQS and NAAQS At Bridger Wilderness Area ($\mu\text{g}/\text{m}^3$)

Pollutant	Averaging Time	Project Sources	Class I PSD Increment	Monitored Background	Project Sources Plus Monitored Background	WAAQS	NAAQS
SO ₂	Annual	0.00	2	9	9	60	80
SO ₂	24-hour	0.00	5	43	43	260	365
SO ₂	3-hour	0.01	25	132	132	1,300	1,300
PM ₁₀	Annual	0.02	4	8	8	50	50
PM ₁₀	24-hour	0.19	8	18	18	150	150
PM _{2.5}	Annual	0.01	N/A	5	5	15	15
PM _{2.5}	24-hour	0.09	N/A	10	10	65	65
NO ₂	Annual	0.01	2	9	9	100	100

Annual average emissions were used. Presented results are for the Project Wide Scenario, 700 producing wells, compressor engine NO_x emissions of 1.5 g/hp-hr and compressor station location C1. Results for all other scenarios, alternatives and other sensitive areas are presented in the Air Quality Technical Report.
 Because the source concentration is sometimes less than 1.0, due to significant figures, they do not show an increase to the monitored background level when added to the monitored background level.

Table 4-32
Summary of Analysis of Potential Acid Deposition Impacts for Pinedale Anticline Project

Sensitive Lake	Sensitive Area	Monitored Background ANC ($\mu\text{eq}/\text{l}$)	Change in ANC (percent)
Ross	Fitzpatrick Wilderness Area	55.8	0.027
Hobbs	Bridger Wilderness Area	63.0	0.047
Black Joe	Bridger Wilderness Area	55.2	0.047
Deep Lake	Bridger Wilderness Area	49.0	0.059
Lower Saddlebag	Bridger Wilderness Area	58.3	0.045

Presented results are for the Project Wide Scenario, 700 producing wells, compressor engine NO_x emissions of 1.5 g/hp-hr and compressor station location C1. Results for all other scenarios and alternatives are presented in the Air Quality Technical Report.

Table 4-33
Pinedale Anticline Project Predicted Impact Noise Levels

Distance From Source (feet)	26,000 hp Compressors (dBA)	Noise Level Above Background (dBA)	Drill Rig (dBA)	Noise Level Above Background (dBA)
100	84.6	45.6	68.8	29.8
200	78.3	39.3	62.7	23.7
500	69.0	30.0	54.0	15.0
1,000	61.3	22.3	47.2	8.2
1,500	56.2	17.2	42.7	3.7
2,000	52.3	13.3	39.4	0.4
3,000	46.2	7.2	34.1	0
5,000	37.5	0	26.0	0
10,000	24.5	0	11.0	0

Background noise level is assumed to be 39 dBA.

noise impacts to residences from compressor stations. However, there are potential well sites which are less than 800 feet from a residence and significant noise impacts are expected to occur at these locations. Noise from well flaring occurs during the initial testing of the well and also periodically during well operation is very loud (sounds like a jet engine).

Noise impacts to sage grouse leks from well drilling and operation would not be significant because well locations would be at least 1,320 feet from sage grouse leks. However, compressor facilities located closer than 2,500 feet to a sage grouse lek could significantly affect sage grouse lek use.

4.10.3.2 Project Wide Exploration/ Development Scenario.

Standard Stipulations Alternative. The potential impacts discussed above in Impacts Common to All Alternatives apply to the Standard Stipulations Alternative for the Project Wide Exploration/ Development Scenario.

Resource Protection Alternative on Federal Lands and Minerals. The impacts discussed above also apply to the Resource Protection Alternative on Federal Lands and Minerals. There are no further resource protection measures which would reduce impacts to air quality on Federal Lands.

Pad Drilling. It is not expected that implementation of pad drilling would either increase or decrease air emissions from the PAPA.

Centralized Production Facilities. Project emissions were analyzed for implementation of centralized production facilities and compared to project emissions without centralized production facilities. The annual project emissions would decrease as the percentage of wells operated by centralized facilities increases.

When centralized facilities are introduced, the glycol dehydration unit would be moved from the well site to the centralized production facility. The glycol heaters at each well would be replaced with one larger heater at the centralized production facility. The total fuel required to operate the individual wells would decrease with the CPF option, thereby resulting in lower overall combustion emissions.

VOC and HAPs emissions from glycol dehydration would also be lower under the CPF option. Because the glycol dehydration units at the individual well sites emit small quantities of VOCs and HAPs, no controls are required. However, the larger glycol dehydration units would trigger BACT. A typical BACT determination for the glycol dehydration units is a condensation unit with 95 percent reduction of VOCs and HAPs.

The centralized production facilities option would also eliminate flashing emissions. Following separation at the wellhead, the gas and associated condensate would be recombined and sent to the centralized production facility. The well product would be processed through a condensate stabilizer, which separates the light hydrocarbons from the heavy hydrocarbons. The light hydrocarbons would be compressed and introduced into the sales gas line. The heavy hydrocarbons are captured and become a salable liquid. Therefore, all emissions from flashing would be eliminated. Also, because there would be no emissions from flashing, the flares required as BACT for high productivity wells would no longer be required if CPF were implemented.

Resource Protection Alternative on All Lands and Minerals. Implementation of this alternative on all lands and minerals would increase the distance from a potential well location to a residence from 350 feet to 1,320 feet on private and state lands and minerals. As discussed above, this would reduce the benzene incremental cancer risk under the most likely exposure scenario from an additional 1.4 people per million to an additional 0.6 people per million. Therefore, implementation of this alternative would eliminate the potential for significant impact under the most likely exposure scenario. It would also reduce the benzene incremental cancer risk for the maximum exposure scenario from an additional 6.4 people per million to an additional 2.6 people per million. This, however, is not considered significant because it is for the maximum exposure scenario which is not likely to occur.

Under this alternative potential noise impacts from drill rigs would be reduced at locations which are between 350 feet and 1,320 feet from a residence because all well locations would be at least 1,320 feet from a residence.

Pad Drilling. It is not expected that implementation of pad drilling would either increase or decrease air emissions from the PAPA.

Centralized Production Facilities. The results of implementing centralized production facilities under this alternative are the same as those described above for the RP Alternative on Federal Lands and Minerals.

4.10.3.3 Anticline Crest Exploration/Development Scenario. All impact analyses described above for the Project Wide Exploration/Development Scenario are essentially the same for the Anticline Crest Exploration/Development Scenario. Detailed results for the Anticline Crest Scenario are provided in the Air Quality Technical Report.

4.10.3.4 No Action Exploration/Development Scenario. Implementation of the No Action Exploration/Development Scenario would eliminate project-related impacts to air quality and noise that could occur under any of the project alternatives.

4.10.4 Additional Mitigation Opportunities. There are additional mitigation measures which should be implemented to further reduce impacts to air quality and from noise. The BLM can impose on Federal lands all of the mitigation measures listed below with the exception of numbers 2 and 5. Adoption of measures on private or state lands would be required by other governmental entities or would be strictly voluntary on the part of the operator.

Air Quality and Noise Mitigation Opportunity 1. To avoid impacts associated with noise from drilling near residential areas, drilling could be limited to winter months (outside of big game winter ranges) when the residents usually keep their windows closed. Extraordinary care should be taken to eliminate all possible sources of noise from the drilling and testing operations. Temporary noise barriers should be considered to lessen noise on adjacent property owners. Noise dampening around engines could be considered (including foam insulation around drilling rigs).

Air Quality and Noise Mitigation Opportunity 2. The operators should install vapor recovery equipment on all production equipment in the Residential Areas SRMZ (i.e., 1,320 feet or less from a residence). This equipment should be designed so

that it controls emissions of all VOCs (including HAPs). The equipment should be adequately maintained and properly operated.

Air Quality and Noise Mitigation Opportunity 3. The operators could locate all wells on private and state lands and minerals at least 800 feet from all residences to eliminate potentially significant noise impacts to the residences.

Air Quality and Noise Mitigation Opportunity 4. The operators could locate all wells on private and state lands and minerals at least 1,320 feet or greater from all residences to eliminate the potential for significant impacts for incremental cancer risk from benzene concentrations for the most likely exposure scenario.

Air Quality and Noise Mitigation Opportunity 5. The operators could install compressor engines with NO_x emissions of 1.0 g/hp-hr or less to further reduce impacts to air quality even though it is not significant at 1.5 g/hp-hr.

Air Quality and Noise Mitigation Opportunity 6. The operators could use natural gas-fired engines to power drill rigs and associated equipment to reduce NO_x emissions within the PAPA.

Air Quality and Noise Mitigation Opportunity 7. Compressor engines should be located 2,500 feet or more from residences and sage grouse leks to eliminate potentially significant noise impacts.

Air Quality and Noise Mitigation Opportunity 8. Electric compression could be installed to eliminate emissions.

4.10.5 Monitoring Recommendations. The operators in cooperation with BLM and other agencies should install air quality and noise monitoring equipment to substantiate impact estimations.

4.11 Geology and Geologic Hazards

4.11.1 Scoping Issues

1. A six mile buffer should be established around Air Force seismic monitoring equipment near Boulder.

2. Operators in the area should consider the potential for seismic events in the development plans.

4.11.2 Significance Criteria. Geologic hazard impacts would be considered significant if:

- landslides or slumps result from project activities; or
- project facilities are damaged due to seismic events or landslides.

4.11.3 Alternative Impacts

4.11.3.1 Summary of Impacts Common to All Alternatives (Except the No Action Exploration/Development Scenario). As discussed in Chapter 3, geologic hazards, such as earthquakes and faults, are not of notable concern in the PAPA. Conflicts with other forms of mineral development are not expected to occur. The primary geologic hazard of concern is disturbance to steep slopes.

Seismic hazards include direct hazards such as ground shaking and surface faulting and indirect hazards such as ground failure and liquefaction of water-saturated deposits such as sandy soils, alluvium and artificial fill. Although a potentially active fault occurs immediately adjacent to the project area in T. 30 N., R. 107 W. (King *et al.*, 1987), the project area is rated low to moderate for seismic risk (Case, 1986). As indicated in Section 3.12, epicenters have been mapped in the vicinity of the project area but the types of large scale earthquakes which would result in substantial damage to operating equipment have not been recorded in the area.

There are no known landslides in the project area (Case *et al.*, 1991). Review of the available soil survey (ERO Resource Corporation, 1988) as well as field verification surveys and aerial photo interpretation have not identified any soils or landforms (hummocky terrain or head scarps) that have slumped or appear to be susceptible to slumping or landslides. With proper well pad placement and road alignment, the potential for increased slumping in the PAPA from any of the project alternatives should not be significant. Slope failures commonly result from: 1) inherent weakness in the composition or structure of rock or soils; 2) variation in the weather, such as heavy rain and snowmelt; and 3) human activity. Research indicates that slopes greater than 55 percent tend towards

instability and the chance of mass failure (Levinski, 1982). By implementing the BLM's Mitigation Guidelines (see Appendix A), which avoid development on slopes greater than 25 percent, landslides or slumps should not result from project activities.

No activity would occur within the six mile Air Force buffer near Boulder.

Compression. None of the proposed compressor station sites are located on slopes greater than 15 percent. The sites are not in areas of active faults or landslides or near areas that have experienced major earthquakes.

Sales Pipeline. The sales pipeline would be constructed in an area that does not have notable geologic hazards. The pipeline would not cross any active faults or landslides and the area has not experienced major earthquakes within historic times. Some areas of windblown sand deposits that are presently stabilized by vegetation may be crossed. Special revegetation techniques, such as using appropriate seed mixes adapted to sandy soils, mulching and the use of snow fences, may be necessary to ensure that disturbed sand deposits are stabilized.

BP Amoco Field Office. The BP Amoco Field Office would also be constructed in an area that does not have notable geologic hazards. The site is not in an area near active faults or landslides or near an area that has experienced major earthquakes.

4.11.3.2 Project Wide Exploration/Development Scenario.

Standard Stipulations Alternative. The primary difference between the alternatives is the amount of disturbance that would occur and the extent to which steep slopes would be disturbed by construction activities. This alternative would result in approximately 1,382 acres of long-term disturbance for the 500 well pad development level and 1,914 acres of disturbance for the 700 well pad development level. Wyoming BLM's Mitigation Guidelines (see Appendix A) that typically avoid disturbance on slopes in excess of 25 percent would apply to this alternative. It includes placement of 154 potential well pad locations on slopes greater than 15 percent but less than 25 percent. These well pads would have larger cut and fill slopes and potentially

increased erosion and reclamation problems. These slopes can also be more difficult to return to their original contour.

RP Alternative on Federal Lands and Minerals.

This alternative would reduce impacts associated with development on steep slopes because it would eliminate or relocate 141 of the 154 well pads that are on slopes of 15 percent or greater. Where practicable, roads and pipelines (other than surface pipelines) would be routed to avoid slopes greater than 15 percent. Most of the disturbance on steep slopes would be eliminated by this alternative.

Pad Drilling. Pad drilling would reduce the amount of long-term disturbance to 998 acres and 1,340 acres for the 500 and 700 well pad development levels, respectively.

Centralized Production Facilities. If centralized production facilities are implemented, there would be a slight increase in short-term disturbance but long-term disturbance would be less (1,244 acres for 500 well pads and 1,706 acres for 700 well pads).

RP Alternative on All Lands and Minerals.

Under this alternative, no disturbance would occur on any slopes in excess of 15 percent anywhere in the project area (including private and state lands and minerals) and potential impacts associated with development on steep slopes would be entirely eliminated.

Pad Drilling and Centralized Production Facilities. The potential impacts from pad drilling and centralized production facilities are the same as those for the RP Alternative on Federal Lands and Minerals.

4.11.3.3 Anticline Crest Exploration/Development Scenario. This alternative would have the same amount of disturbance as described for the Project Wide Scenario but it would be limited to the anticline crest area and three hot spots somewhere within the PAPA.

Standard Stipulations Alternative. Wyoming BLM's Mitigation Guidelines (see Appendix A) that typically avoid disturbance on slopes in excess of 25 percent would apply. This alternative includes placement 154 potential well pad locations on slopes greater than 15 percent.

RP Alternative on Federal Lands and Minerals.

This alternative would reduce impacts associated with development on steep slopes because it would eliminate or relocate 139 of the 154 well pads that are on slopes of 15 percent or greater. Where practicable, roads and pipelines (other than surface pipelines) would be routed to avoid slopes greater than 15 percent. Most of the disturbance on steep slopes would be eliminated by this alternative.

Pad Drilling and Centralized Production Facilities.

The potential impacts from implementing these mitigation measures are the same as described above for the Project Wide Scenario.

RP Alternative on All Lands and Minerals.

Under this alternative, where practicable, no disturbance would occur on any slopes in excess of 15 percent anywhere in the project area (including private and state lands and minerals) and potential impacts associated with development on steep slopes would be avoided.

Pad Drilling and Centralized Production Facilities.

The potential impacts from implementing these mitigation measures are the same as described above for the Project Wide Scenario.

4.11.3.4 No Action Exploration/Development Scenario. Implementation of this alternative would eliminate any disturbance to slopes.

4.11.4 Additional Mitigation Opportunities.

There are no additional mitigating opportunities related to geology and geologic hazards.

4.12 Paleontological Resources

4.12.1 Scoping Issues. No concerns were expressed during public scoping related to paleontological resources.

4.12.2 Significance Criteria. A significant impact to paleontological resources would occur if important fossils, which could substantially add to scientific understanding of paleontological resources, are destroyed.

4.12.3 Alternative Impacts

4.12.3.1 Summary of Impacts Common to All Alternatives (Except the No Action Exploration/Development Scenario). As described in Chapter 3, the lacustrine sediments of the Green River Formation are known for their fish, bird, crocodile and other vertebrate fossils. The Wasatch Formation is composed mainly of fluvial deposits which are best known for their fossil mammals and mollusks. The Bridger Formation, which is crossed by the sales pipeline, is also rich in mammal fossils and has produced fossils turtles, freshwater mollusks, leaves, fish, crocodiles and birds and mammals. Paleontological sites are known within and adjacent to the PAPA, therefore, the possibility exists that paleontological resources of scientific significance could be disturbed and discovered by earthmoving activities during project development.

All of the alternatives, except the No Action Exploration/Development Scenario, have the potential for uncovering or disturbing paleontological resources during construction and excavation of the project facilities. Improved access and increased visibility may cause fossils to be damaged or destroyed due to unauthorized collection and vandalism.

Potential impacts would be similar for both the Project Wide and Anticline Crest scenarios. The RP Alternatives (with pad drilling) at the 500 well pad development level would disturb approximately 1,098 (15 percent) fewer acres in the short-term than the SS Alternative. For the 700 well pad development level, 1,627 (18 percent) fewer acres would be disturbed with the RP Alternatives using pad drilling. The RP Alternatives would also limit well pads to 4 per section in the Blue Rim Area. Roads and pipelines would be located to avoid sensitive paleontological sites in this area. Therefore, the RP alternatives would have less potential to disturb significant paleontological resources. However, with the RP alternatives there would be less potential to uncover and reveal fossils of significant scientific interest which would otherwise remain buried and unavailable to scientific study.

BLM standard stipulations and conditions of approval would be sufficient to prevent significant impacts to paleontological resources. BLM could require paleontological field surveys, conducted by a qualified paleontologist, at any project site which has a high potential for encountering paleontological resources. BLM stipulations require that any

paleontological resources discovered during construction must be immediately reported to the BLM and all operations in the immediate vicinity of the discovery must be halted until written authorization to proceed is issued by the BLM. The BLM would conduct an evaluation of the discovery and determine appropriate actions to prevent the loss of significant scientific values. Removal of historical material or archaeological or paleontological deposits from state lands is governed by W.S. 36-1-114, 115, 116 (Antiquities Act).

4.12.3.2 No Action Exploration/Development Scenario. This alternative would eliminate the potential to damage or destroy significant paleontological resources. This alternative would also eliminate the potential to discover fossils of significant scientific interest.

4.12.4 Additional Mitigation Opportunities. There are additional mitigation measures which should be implemented to further reduce impacts to paleontological resources. The BLM can impose the following mitigation measures as long as they are not on private or state lands. Adoption of measures on private or state lands would be required by other governmental entities or would be strictly voluntary on the part of the operator.

Paleontological Mitigation Opportunity 1. The operators should instruct workers about the potential for encountering fossils in the project area and what to do should fossils be discovered during project-related activities. It should also be explained to the workforce that it is illegal to remove fossil materials from Federal lands without a permit.

Paleontological Mitigation Opportunity 2. Although the Blue Rim Area of the PAPA (see Figure 3-15) is known to contain significant paleontological resources, the potential for other areas to contain significant fossils is generally unknown. A field survey should be conducted to identify what other portions of the project area have high potential for paleontological resources. The results of this survey should be used to narrow down the extent of site-specific paleontological field surveys for surface disturbing activities.

4.13 Water Resources

4.13.1 Scoping Issues

1. Address impacts from draw down of water level in aquifer and changes in pH level, especially if wells become highly alkaline (need to establish a monitoring program).
2. All pits should be lined.
3. Storm water permits and best management practices to control off-site runoff will be required.
4. Describe project activities that may affect water quality.
5. Minimize use of water.
6. Implement a surface water quality monitoring program - cost should be borne by the operators.
7. Eliminate pits at all well locations - instead install tanks and tank batteries.
8. Impaired segments of the New Fork River and Pole Creek require the development of Total Maximum Daily Loads (TMDLs).
9. No streams requiring TMDLs occur in the proposed project area.
10. Discuss how the Clean Water Act's antidegradation policy will be implemented for this project.

4.13.2 Groundwater

4.13.2.1 Significance Criteria. Impacts to groundwater supplies or springs would be considered significant if:

- the natural flow of water to local springs is interrupted; or
- new operator water wells that are first tested with a neutral pH (about 7.0) later become significantly alkaline (pH 8.0 to 10) after pumping; or
- groundwater quality is degraded so that it can no longer be classified for its current use; or
- the water table is lowered, as a result of drilling water supply wells, to a level that would require replacement or deepening of other groundwater wells in the project area.

The subsurface could be affected by groundwater withdrawals and wastewater injection. Anticipated impacts consist of drawdown in aquifers from which water is extracted for drilling. There could also be loading of deeper receiving zones by wastewater injection. There is the potential for contamination of aquifers during drilling, completion and production of the gas wells through drilling/fracturing fluids and/or

produced water. There is also the potential for shallow aquifers to be contaminated by leakage from the reserve pit and by onsite water wells with originally neutral pH's that suddenly become alkaline through pumping. Drilling and completion techniques of these water wells will need to be changed in order to find the cause of the alkalinity change and correct the problem. For the reasons below, including regulatory programs currently in place, the potential for these impacts to occur is anticipated to be negligible.

4.13.2.2 Alternative Impacts

4.13.2.2.1 Summary of Impacts Common to All Alternatives (Except the No Action Exploration/Development Scenario). Ultra is proposing to recomplete an existing well to a Class II Underground Injection Control Well for the disposal of produced water. Potential impacts from this well would be loading of deeper receiving zones and potential contamination of upper aquifers. However, potential impacts from an injection well are anticipated to be insignificant because the well must be permitted with the WOGCC. Their rules and regulations require that the operator demonstrate that the proposed disposal operation will not endanger fresh water sources. The disposal well must be cased and cemented in such a manner that damage will not be caused to oil, gas, or fresh water sources. The operator must also demonstrate mechanical integrity of the well at least every five years and, if tests fail, the well must be repaired, shut-in or operated at a reduced injection pressure.

Significant impact to the aquifer from drilling and completion fluids and produced water are not likely because all production wells would be cased and cemented to protect subsurface mineral and freshwater zones according to WOGCC rules and regulations. Section 22 (a)(i) of the rules state "*surface casing shall be run to reach a depth below all known or reasonably estimated utilizable domestic fresh water levels and to prevent blowouts or uncontrolled flows*". Wells that are no longer productive would be plugged and abandoned according to procedures outlined in the WOGCC's rules and regulations.

Contamination of shallow aquifers from reserve pits is unlikely because the reserve pits would be lined and would be constructed in cut areas or in compacted and stabilized fill in accordance with

WOGCC rules. Rule 22 (b) states *"before drilling commences, approval to construct proper and adequate reserve pits for the reception and confinement of mud and cuttings and to facilitate the drilling operation shall be applied for and received in accordance with Chapter 4, Section 1. Special precautions, including but not limited to, an impermeable liner and/or membrane, monitoring systems, or closed systems, shall be taken, if necessary, to prevent contamination of streams and potable water and to provide additional protection to human health and safety in instances where drilling operations are conducted in close proximity to water supplies, residences, schools, hospitals, or other structures where people are known to congregate. Pits shall be located no closer than three hundred fifty feet (350') from any of the aforementioned items. The Supervisor may impose greater distances for good cause and likewise grant exceptions to the 350 foot rule"*. Adequate regulations are in place to protect shallow aquifers.

If the quality of groundwater becomes unacceptable for any purpose, other water supply sources would be investigated and permitted through the appropriate agency.

Compression. Construction and operation of compressors at any of the proposed compressor station sites would not have an impact to groundwater resources.

Sales Pipeline. Construction of the sales pipeline would not cause potential impacts to groundwater in the area if BMPs and erosion control measures for protection of surface water are applied.

BP Amoco Field Office. It is not anticipated that construction of the BP Amoco Field Office would have any impacts to groundwater.

4.13.2.2.2 Project Wide Exploration/ Development Scenario

Standard Stipulations Alternative. Groundwater withdrawals for drilling water would be from the lower Wasatch sandstone aquifers. Under this alternative, 60 to 90 gas wells would be drilled annually. Each gas well would require 25,000 barrels of drilling water (typically from groundwater sources). This translates to a total water usage in the project area from water supply wells of 200 to 300 acre-feet/year (65 to 100 million gallons/year). Spread over the entire PAPA,

and assuming a homogeneous aquifer with a typical storage coefficient, this would cause an average drawdown in the groundwater aquifer of 1 to 1.5 feet/year. The aquifer would be recharged annually. These projections are the same for both the 500 and 700 well pad development scenarios.

The sandstones of the Wasatch are generally interconnected, but shale horizons interrupt the section and would inhibit flow between horizons. For example, a 300-foot shale in the Wasatch Formation separates the upper sandstones in which most stock-water wells are completed from the lower sandstones in which the water-supply wells that the operators use are completed. Consequently, no significant impacts to other groundwater wells in the project area from project-related activities are anticipated.

RP Alternatives. The potential impacts from these alternatives would be somewhat less than the SS Alternative described above because drilling would take place at a slower pace and there would be fewer water supply wells drilled each year and the quantity of water removed from the aquifer for drilling water supply would be reduced. There would also be fewer reserve pits open at any one time. This alternative would result in the drilling of between 40 and 60 wells annually. This translates to a total water usage in the project area from water supply wells of 130 to 200 acre-feet/year (40 to 60 million gallons/year). Spread over the entire PAPA, and assuming a homogeneous aquifer with a typical storage coefficient, this would cause an average drawdown in the groundwater aquifer of 0.7 to 1.0 feet/year. Impacts from this alternative are not considered significant or materially different from those described for the SS Alternative.

Pad Drilling. Implementation of pad drilling would allow for fewer well pads to be constructed, however, the amount of water usage and therefore potential impacts would not change due to pad drilling.

Centralized Production Facilities. The use of centralized production facilities would not have any effect on the potential impacts to groundwater.

4.13.2.2.3 Anticline Crest Exploration/ Development Scenario

Standard Stipulations Alternative. The potential impacts for this alternative under the Anticline Crest Scenario are the same as those for the Project Wide

Scenario. However, water wells and potential impacts to groundwater would be concentrated on the anticline crest.

RP Alternatives. Potential impacts are the same as for the RP alternatives described under Project Wide Scenario, however, water wells and potential impacts to groundwater would be concentrated on the anticline crest.

Pad Drilling and Centralized Production Facilities. Potential impacts from pad drilling and centralized production facilities are the same as those described for the Project Wide Scenario.

4.13.2.2.4 No Action Exploration/Development Scenario. Implementation of the No Action Exploration/Development Scenario would eliminate project-related impacts to groundwater that could occur under any of the project alternatives.

4.13.2.3 Additional Mitigation Opportunities. There are additional mitigation measures which should be implemented to further reduce impacts to groundwater. The BLM cannot impose these mitigation measures because the jurisdiction for groundwater management lies with the State of Wyoming - their adoption would be required by the state or would be strictly voluntary on the part of the operators.

Groundwater Mitigation Opportunity 1. To safeguard against immediate lowering of the water level in existing domestic or stock wells, any water supply well within 1,000 feet of an existing stock or domestic well should have its production zone (perforated interval) at least 200 feet below that of the domestic well. This would be particularly important for wells drilled in the Residential Areas SRMZ shown on Figure 3-7.

Groundwater Mitigation Opportunity 2. If adverse impacts are observed in an existing domestic or stock well due to PAPA water supply wells, the operators should offer use of the water supply well in place of the impacted well on a temporary or long-term basis, or choose to deepen the impacted well.

Groundwater Mitigation Opportunity 3. The operators could cement behind the casing in water zones used for livestock to prevent potential drainage and contamination from other aquifers.

Groundwater Mitigation Opportunity 4. When water wells are drilled by the operators, they should seal off the upper aquifers (up to 500 feet) that supply water to the livestock wells to avoid drawdown and potential contamination of that water supply.

4.13.2.4 Monitoring Recommendations. The operators should monitor and maintain a record of the specific conductance of all new water supply wells drilled in the project area to evaluate the quality of source options in the event some mitigation is required. The deeper groundwater supply used as drilling water has a somewhat higher salt content than existing domestic and stock wells.

A groundwater monitoring program, such as the one currently being conducted by Ultra and the Mesa livestock operators, should be developed to include the entire project area. The monitoring program should be designed by a qualified hydrologist and the results reported annually during the annual development review described in Section 4.1.3. The groundwater monitoring program should include routine measurement of groundwater levels in existing stock wells and groundwater quality to insure that wells are not being impacted (drawdown of water table and degradation of quality) beyond their intended use as a result of the proposed project.

4.13.3 Surface Water

4.13.3.1 Significance Criteria. Impacts produced by the alternatives would be considered significant if the following occur:

- construction-related erosion and runoff into intermittent drainages and subsequently into perennial streams alter the physical characteristics of streambeds;
- construction-related erosion and runoff into intermittent drainages and subsequently into perennial streams cause increased sedimentation which degrades the quality of water;
- accidental spill of fuels or liquids associated with drilling, construction and production activities affects the quality of surface water; or
- an increase in sediment loading causes any of the rivers or streams to be identified as a water which does not support its designated use.

Because the New Fork and Green rivers flow through the project area, potentially significant impacts could occur to water quality from increased

erosion and sedimentation from construction-related runoff (i.e., non-point source pollutants). Impacts from sedimentation would not be significant if the operators strictly comply with BLM's Mitigation Guidelines (see Appendix A), apply relevant storm water BMPs, and implement appropriate mitigation measures described below. If significant impacts to area waters from sedimentation are to be avoided, attention to control of non-point sources of sediment will be necessary.

There is a potential impact (increased sedimentation) to water quality from discharge of hydrostatic test water during pipeline testing. This is not expected to produce significant impacts because it is short-term in nature and the operators would be required to comply with WDEQ/WQD regulations. There could be water quality impacts from accidental spills. Depending on where such a spill occurred, the impacts could be significant.

4.13.3.2 Alternative Impacts

4.13.3.2.1 Summary of Impacts Common to All Alternatives (Except the No Action Exploration/Development Scenario)

State of Wyoming Storm Water Requirements. One of the greatest areas of concern for impacts to surface water is sedimentation resulting from construction-related runoff. Sediment can flow to intermittent drainages and ultimately to perennial streams. In 1972, the Federal Clean Water Act (CWA) was amended to provide that the discharge of any pollutants to surface waters of the United States had to be regulated through the issuance of a NPDES permit. Congress added Section 402 (p) to the CWA in 1987 to establish a comprehensive framework for addressing storm water discharges under the NPDES program and in 1990, the EPA published regulations requiring all storm water discharges associated with industrial facilities, including construction projects where five or more surface acres are disturbed, to obtain NPDES permits. WDEQ/WQD has primacy from EPA to issue a general permit to dischargers of storm water associated with construction activity. *"Specifically, this permit will cover any clearing, grading or excavation project which will disturb five or more (not necessarily contiguous) surface acres."* Any discharge activities not specifically called out in the general permit would require an individual permit. For the PAPA, this would include most of the well pad

locations, compressor station sites, roads and pipeline routes.

Under the permit, operators who are required to obtain a NPDES permit to discharge storm water must prepare a Storm Water Pollution Prevention Plan (SWPPP) and submit a Notice of Intent (NOI) to the WDEQ/WQD 30 days before beginning construction activities. The SWPPP outlines the potential pollution sources and the measures which will be used to prevent storm water contamination. The NOI describes the construction project and route(s) that storm water may take from the construction site to area waters. WDEQ/WQD reviews this information to determine if the operator may discharge storm water under the general permit, or if an individual NPDES permit is required. It is not anticipated that individual NPDES permits would be required for discharge of storm water within the PAPA.

Operators would be required to comply with the NPDES storm water regulation where they propose to disturb greater than five acres. The five acres do not necessarily have to be contiguous (i.e., well pads, roads and pipeline disturbance would all be included to calculate the total area disturbed). It is likely that most of the single well pads (and all of the pad drilling wells) and associated roads and pipelines would result in greater than five acres of disturbance and would require compliance with the NPDES storm water regulations.

The purpose of the NPDES permit is to prevent, or at least minimize, pollution of waters of the state. The degree of pollution control specified in the SWPPP would depend on the individual situation and the potential impact for causing pollution to surface water. If the potential to cause pollution to any surface water is minimal, then only minimal surface controls would be expected. If, however, there is a greater potential to cause impacts to surface water (such as construction activities in drainage sub-basins 1 through 5 and 46 shown on Figure 3-14), then more comprehensive and complete pollution controls and on-site inspections by WDEQ would be required.

It is important to note that discharges covered under the general permit are strictly limited to those entirely composed of storm water associated with the construction activity. Any other discharges associated with the construction activity (or operation) would require compliance with an individual NPDES permit.

BLM Erosion Control, Revegetation and Restoration Plan. The operators are required to prepare and submit an Erosion Control, Revegetation and Restoration Plan (ERRP) to the BLM for disturbance on Federal lands and minerals. The purpose of developing an ERRP is to allow for cooperative innovation in site development and reclamation of a disturbed area to a pre-determined land use for well field activities. The main elements of the plan include discussions of zero runoff, erosion control measures, revegetation and monitoring site reclamation progress. An expanded SWPPP could satisfy the ERRP requirements for BLM. The key points of the ERRP (erosion control, revegetation, and reclamation) are addressed in point 10 of the 13 point *Surface Use Program* submitted with a site specific application for permit to drill (APD) (see Onshore Oil and Gas Order No. 1; Section III.G.4.(b)). However, a more comprehensive ERRP may be warranted using the outline found in Appendix A.4 where sensitive site specific situations dictate (e.g., slopes greater than 15 percent, sensitive soils, within 500 ft. of riparian areas or waters, sensitive viewshed, etc.).

Erosion Control Measures and Best Management Practices. Erosion control measures and BMPs include schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of area waters. BMPs also include treatment requirements, operation procedures, and practices to control site runoff, spillage or leaks, waste disposal, or drainage from raw material storage (i.e., topsoil and subsoil piles). Typical BMPs and erosion control measures that have direct applicability to activities in the PAPA (i.e., silt fences, waterbars, etc.) are provided in Appendix H.

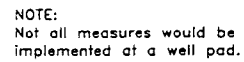
BLM has determined that well pads on Federal lands and minerals are to be designed to have zero uncontrolled runoff from the pad at least until surrounding reclaimed areas have been stabilized (see Appendix A). Zero uncontrolled runoff means that no portion of natural or man-caused liquid would leave the disturbed area without first passing through a sediment device to filter sediment. No hydrocarbon flow would be allowed to leave the well pad. Stabilization means that point in time when neither erosion nor deposition occurs which is greater than pre-disturbance. This point must be measurable (site monitoring) and self-sustaining (i.e., not dependent on site maintenance). To achieve zero uncontrolled

runoff, the following factors need to be incorporated into well pad design: 1) rainfall or snowmelt that falls or runs onto the well pad should be captured in the reserve pit which has been sized to contain drilling fluids and cuttings along with runoff from the pad from a minimum of a 10-year, 24-hour storm event; or 2) rainfall and snowmelt should be collected in a separate containment pit where it is allowed to evaporate or infiltrate. Infiltration should only be considered if measures are taken to insure that runoff is not contaminated. Where appropriate, well pad design should insure that off-site runoff is diverted around the well pad by berms or ditches (see Figure 4-7). This would minimize off-site runoff from flowing onto and accumulating on well pads. Fill slopes should also have a containment berm on the bottom of the slope to contain sediment from the fill slopes and prevent sediment transport. This is especially important near intermittent and perennial streams and on slopes. Where zero runoff is not feasible from well pads, drainage from these pads should be designed to be directed to a sediment trap or basin to capture sediment. Failure to apply these measures could result in significant impacts to area streams.

During interim reclamation of producing locations, the well pad should be reclaimed as close as possible to the original contours. Cut and fill slopes should be reduced to a 3:1 slope or less. In those areas where slopes cannot be reduced they should be graded to the gentlest slope possible and revegetated for erosion control. Terraces or serration (steps) should be used as necessary to shorten slope lengths. All unused portions of the producing location should be recontoured, resurfaced with topsoil and revegetated.

One important concept in controlling sedimentation impacts is to allow disturbance to remain unstabilized for the shortest period possible. It has been observed in the area that some well pads have been constructed many months prior to the well being drilled. In most cases, these well pads are built early to avoid construction during the winter. However, unstabilized drill sites, constructed and not used for several months, prolongs the period during which the well pad can contribute to sedimentation problems and is exacerbated if the site is left disturbed over-winter. The BLM would need to closely monitor construction schedules for well pads in the PAPA so that construction does not outpace drilling needs. BLM would ensure close monitoring of these constructed sites for runoff that would increase stream sedimentation. Similarly, interim well

<p>Examples of Possible Best Management Practices to Control Sediment from Well Pads</p>
<p>Pinedale Anticline Environmental Impact Statement</p>



pad reclamation in the project area is being delayed. In the future, BLM would evaluate other methods for drying pits so that interim well pad reclamation can occur more quickly. Interim reclamation would become a priority for both the BLM and the operators. Potential impacts from delayed reclamation include potential sedimentation, establishment of noxious weeds, visual intrusions and habitat reduction.

Road surfacing requirements need to be based on soil sampling, and excessive road widths need to be avoided. Roads may be the largest contributor of sediment in the PAPA. However, their design has in the past neglected to consider potential impacts to area waters. Natural drainages should not be interrupted and adequate cross drain spacing and sizing need to be installed to prevent sedimentation. Adequate rip-rap should be installed at the inlet and outlet of all culvert installations.

Spill Response Practices. Spills of fuel and other materials used during drilling and production in the project area could result in significant impacts to water quality. A spill could reach intermittent drainages and, if large enough, could reach perennial waters. Of particular concern would be a spill into the Green or New Fork rivers from fuel being transported to the project area. If the operators store more than 660 gallons of condensate on a well pad, they would be required to prepare a Spill Prevention Countermeasure and Control (SPCC) Plan^{*}. In addition, the State of Wyoming has spill reporting requirements. According to Chapter 4 of the WDEQ/WQD rules and regulations, any spill or other release of hazardous substances, fuels, oils or other petroleum product must be contained and cleaned up in a timely and diligent manner. Any spill or release of more than 25 gallons, or which results in a visible sheen on water, or a visible deposit on the bottom or shoreline of any waterbody, must be reported to the WDEQ/WQD within 24 hours.

Hydrostatic Testing of Pipelines. Once pipelines are installed, they would be hydrostatically tested with water. The subsequent discharge of the test water would be a short-term activity but would require coverage under a NPDES permit. In order to permit these temporary discharges in a timely manner, the WDEQ/WQD has issued a general permit for temporary discharges. This general permit for temporary discharges authorizes the discharge of *"wastewaters to surface waters of the state associated with: hydrostatic testing of pipes, tanks or*

other similar vessels, disinfection of potable water lines, pump tests of water wells, construction dewatering, treatment of gasoline or diesel contaminated ground water and the discharge of wastewater from swimming pools".

Potential Impacts to Surface Water From Groundwater Withdrawals. The impacts of groundwater withdrawal on the quantity of groundwater discharged to the surface water would be negligible for all alternatives. It was estimated in Chapter 3 that the flow of groundwater discharge from the PAPA to surface water is on the order of 14,000 acre-feet/year. At peak, groundwater withdrawal was estimated at 200 to 300 acre-feet/year which is less than two percent of the total groundwater which contributes to surface water.

Compression. Construction at any of the compressor station sites would not cause potential impacts to surface water in the area if BMPs and erosion control measures for protection of surface water are applied. None of the proposed sites are located in areas that drain to the Class I portion of the Green River. The compressor stations would not be constructed in any major drainages. Operators would be required to comply with the State of Wyoming Stormwater Rules and Regulations as described above.

Sales Pipeline. The sales pipeline would cross the Green and the Blacks Fork rivers which would cause a temporary increase in turbidity of these rivers if they are crossed using open cut techniques. Disturbed banks have the potential to contribute to sedimentation and water quality impacts. If these rivers are crossed by open cut techniques, mitigation measures may be necessary to minimize sedimentation impacts. These measures could include: minimizing disturbance; conducting the crossing during low flow periods in the summer; replacing streambed gravels; boring of perennial waters instead of open trenching; and ensuring a SPCC plan is developed and all necessary materials are available prior to construction.

BP Amoco Field Office. The field office would not be constructed in any major drainages. BP Amoco would be required to comply with the State of Wyoming Stormwater Rules and Regulations as described above.

^{*} Refer to 40 CFR Part 112.

4.13.3.2.2 Project Wide Exploration/Development Scenario. Impacts to surface water would be similar for the 500 and 700 well pad development levels. There would be greater impact with the 700 well pad development level because of the 200 additional well pads and associated roads and pipelines.

Standard Stipulations Alternative. There are certain restrictions on all lands which would reduce impacts to surface water. If the total amount of disturbance (well pad, road and pipeline) is five acres or greater, the operator would be required to apply for coverage under the general NPDES permit for storm water as described above. This requires preparation of an SWPPP which would set forth BMPs to limit construction-related runoff and therefore the potential for increased sediment in area waters, if these plans are properly implemented. Construction on Federal land would also be required to comply with erosion control and reclamation guidelines (see Section 4.13.3.2.1). The SWPPP and ERRP could be combined for activities on Federal lands and minerals. Impacts to surface water would be reduced on Federal lands and minerals because of mitigation guideline restrictions such as avoiding placement of well pads on slopes 25 percent or greater and avoiding placement of wells within 500 feet of perennial streams and 100 feet of intermittent streams. The requirement for reduction of impacts on state and private lands and minerals is limited to those activities which are greater than five acres requiring compliance with BMPs through the SWPPP. There are no restrictions that could be enforced regarding sediment control on state and private lands which are less than five acres. The operator's are currently not adequately implementing BMPs. Neither BLM nor the State of Wyoming are adequately enforcing these requirements in the PAPA. The continued lack of implementation of adequate sediment controls could result in a significant impact to area perennial waters.

There are several potential well pad locations on the west side of the PAPA which would have the potential to discharge storm water to the Green River where it is a Class I stream. They occur in the drainages shown on Figure 3-14. In these cases, a SWPPP must be submitted to WDEQ/WQD for review and approval at least 30 days prior to commencing construction activities. In these areas, WDEQ/WQD would require an on-site inspection of

storm water controls by their personnel (Abernathy, 1998). A list of the leases which have drainage to the Class I area of the Green River is shown on Table 4-34.

RP Alternative on Federal Lands and Minerals.

The restrictions described above for the SS Alternative would also apply to all lands in this alternative. However, there are additional measures which would reduce impacts. Under this alternative, placement of well pads and construction of roads and pipelines (other than surface pipelines) would be avoided on slopes 15 percent or greater on Federal lands and minerals. This alternative would also reduce the potential impacts to surface water because there would be less annual surface disturbance.

On Federal lands and minerals, potential well pad locations would be limited to 8/section in those areas which would drain to the Green River where it is designated as Class I (see Table 4-34). This would result in a significant reduction of disturbance in these drainage sub-basins. If 16 well pads/section were allowed to be developed in these areas, up to 110.4 acres/square mile of disturbance could occur. Eight well pads/section would reduce disturbance by almost 50 percent to 62 acres/square mile (assuming 3.5 acres/well pad and 0.5 miles of road and gathering pipeline corridor per well pad). Portions of all of the leases listed on Table 4-34 would be affected by this alternative. These further restrictions would not apply to state and private lands and minerals. This alternative would not, however, significantly reduce impacts to water quality unless the operators, BLM and the State of Wyoming ensure implementation and inspection of BMPs to control off-site sedimentation.

However, even if well pad density on Federal lands and minerals was restricted, there could still be development at 16 well pads/section on private lands and minerals in very close proximity to the river. On these lands, 62 potential well pad locations could be developed. The residual impacts from this development may still result in significant impacts to the Green River.

Pad Drilling. Implementation of pad drilling would reduce the total surface disturbance and would therefore, reduce impacts to surface water accordingly.

Table 4-34
Summary of Potential Well Pad Locations in Leases Which Drain to the Class I Area of the Green River for the Project Wide Exploration/Development Scenario

Lease	Lessee	Potential Well Pad Locations in the Lease	Total Acres in the Lease	Potential Well Pad Locations in the Portion of the Lease That Drains to the Class I Water	Acres of the Lease that Drain to the Class I Water
WYW113417	Ultra Resources Inc.	18	732	17	684
WYW113418	Ultra Resources Inc.	44	1,753	44	1,753
WYW114051	Ultra Resources Inc.	16	640	16	640
WYW115618	Shama Zoe Ltd.	45	1,829	44	1,789
WYW116264	McMurry Oil Company	53	2,203	5	285
WYW125141	Shama Zoe Ltd.	27	1,272	5	236
WYW128254	HS Resources Inc.	58	2,523	41	1,813
WYW128255	HS Resources Inc.	47	2,042	43	1,841
WYW128819	Shama Zoe Ltd.	4	159	1	53
WYW130234	HS Resources Inc.	42	1,665	1	45
WYW130969	HS Resources Inc.	29	1,271	29	1,267
WYW131386	Starwood Inc.	1	40	1	40
WYW131387	Starwood Inc.	16	639	16	639
WYW131388	Starwood Inc.	31	1,270	20	814
WYW131912	Shama Zoe Ltd.	38	1,591	0	1
WYW16167	Ultra Resources Inc.	59	2,350	10	362
WYW8593	Ultra Resources Inc.	56	2,540	10	370
Private Lands and State Minerals				3	119
Private Lands and Minerals				59	2,348
Total		584	24,519	365	15,099

Centralized Production Facilities. The use of centralized production facilities would not have an effect on potential impacts to surface water.

RP Alternative on All Lands and Minerals. Impacts to surface water would be further reduced by applying the restrictions described above for the RP Alternative on Federal Lands and Minerals to state and private lands. If this alternative is implemented, the 2,470 acres of private and state lands and minerals in drainage sub-basins that flow to the Green River would be developed at no more than eight well pads/section. Potentially significant impacts from development on private and state lands would be eliminated.

Pad Drilling and Centralized Production Facilities. Implementation of these mitigation measures would have the same effect under this alternative as for the RP Alternative on Federal Lands and Minerals.

4.13.3.2.3 Anticline Crest Exploration/Development Scenario. Impacts to surface water under this scenario would be similar to those for the

Project Wide Scenario. Disturbance and potential impacts would be concentrated on the anticline crest.

Standard Stipulations Alternative. A list of the leases which have drainage to the Class I area of the Green River for the Anticline Crest Scenario is provided on Table 4-35.

RP Alternatives. Impacts to surface water would be the same as those described for the Project Wide Scenario, however, potential impacts would be concentrated on the anticline crest.

4.13.3.2.4 No Action Exploration/Development Scenario. Implementation of the No Action Exploration/Development Scenario would eliminate project-related impacts to surface water that could occur under any of the project alternatives.

4.13.3.3 Additional Mitigation Opportunities. There are additional mitigation measures which should be implemented to further reduce impacts to

Table 4-35

Summary of Potential Well Pad Locations in Leases Which Drain to the Class I Area of the Green River for the Anticline Crest Exploration/Development Scenario

Lease	Lessee	Potential Well Pad Locations in the Lease	Total Acres in the Lease	Potential Well Pad Locations in the Portion of the Lease That Drains to the Class I Water	Acres of the Lease that Drain to the Class I Water
WYW125141	Shama Zoe Ltd.	27	1,272	5	236
WYW128254	HS Resources Inc.	58	2,523	28	1,120
WYW128255	HS Resources Inc.	47	2,042	26	1,145
WYW130234	HS Resources Inc.	42	1,665	1	45
WYW130969	HS Resources Inc.	29	1,271	10	467
WYW16167	Ultra Resources Inc.	59	2,350	9	317
WYW8593	Ultra Resources Inc.	56	2,540	10	370
Total		318	13,663	89	3,700

surface water. The BLM can impose the following mitigation measures on Federal lands. Adoption of measures on private or state lands would be required by other governmental entities or would be strictly voluntary on the part of the operator.

Surface Water Mitigation Opportunity 1. Even though not required, the operators should consider jointly preparing a field-wide SPCC Plan which would set forth the methods and procedures for preventing and cleaning up and minimizing any accidental discharges to the surface. That plan should pay particular attention to the transport of fuel through the project area and the potential for a spill that directly or indirectly affects perennial waterways. In addition, the plan should list the types of emergency response equipment necessary to respond to such spills. This response material should be purchased by the operators and stored in the project area with easy access. The ability of the operators and their contractors to respond to a spill should be reviewed during the annual development review.

Surface Water Mitigation Opportunity 2. To reduce sediment impacts on non-Federal lands and minerals, the operators should consider restricting placement of well pads within 500 feet of a perennial stream, riparian area or wetland and 100 feet of an intermittent stream on state and private lands and minerals.

Surface Water Mitigation Opportunity 3. The operators should develop the ERRP/SWPPP and apply BMPs on all lands regardless of the acreage disturbed. These plans should focus on sites where

discharges could result in adverse impacts to water quality.

Surface Water Mitigation Opportunity 4. The operators should develop runoff designs that require treatment of all runoff for all well pads regardless of land and mineral ownership. This would be particularly beneficial in areas where disturbance is close to perennial waterbodies and wetlands.

Surface Water Mitigation Opportunity 5. Throughout the PAPA, surface pipelines should be considered where steep slopes are traversed (greater than 15 percent) to reduce construction-related erosion and ultimately reduce sedimentation of area waters. Surface pipelines are used elsewhere in the Green River Basin. The reluctance of the operators to use aboveground pipelines in the project area needs to be further evaluated.

Surface Water Mitigation Opportunity 6. Currently, pipeline crossings of rivers in the project area are made by open cut techniques which contain none of the techniques currently available to reduce downstream water quality impacts. The open cut techniques are in compliance with current regulatory requirements. One way to substantially reduce downstream water quality degradation would be for the regulatory agencies which have authority to permit pipeline river crossings (COE and WDEQ) to evaluate the feasibility of requiring the operators to bore the Green, New Fork and Blacks Fork rivers during future pipeline crossings.

Surface Water Mitigation Opportunity 7. Transportation planning should prioritize routes that

minimize the need to transport fuels in the project area in the vicinity of perennial streams.

Surface Water Mitigation Opportunity 8. To reduce the potential for water quality degradation, the operators should reduce the time between initial well pad construction and actual drilling to the shortest time practicable (e.g., pads should be constructed no sooner than 30 days prior to actually spudding the well). The operators should consider readily available techniques for drying pits so that the time between the completion of drilling and interim well pad reclamation is reduced (e.g., if a well is drilled in the spring, interim reclamation should be complete by the end of the summer). If a well is completed late in the fall, the pit should be emptied and the site stabilized for winter.

Surface Water Mitigation Opportunity 9. BLM should employ additional inspection staff to monitor construction activities in the field. In particular, that staff should be fully knowledgeable about techniques and BMPs to control sedimentation. The operators should employ additional staff that would be responsible for implementing BMPs and compliance.

4.13.3.4 Monitoring Recommendations.

Regardless of which alternative is implemented, it is recommended that the operators develop a surface water monitoring program in cooperation with the State of Wyoming and the BLM. The monitoring program should be reviewed with the public during the annual development review. The purpose of the surface water monitoring program would be to establish baseline conditions in the New Fork and Green rivers which are currently included in Table E of the State of Wyoming's 303(d) program. The State of Wyoming has already begun monitoring on these streams but the results are not available at this time. Therefore, it is not known if the streams are currently supporting their designated uses. The monitoring program should be designed to verify that the rivers do or do not support their designated use prior to activity under this EIS. If this information is not established, the operator's could be pointed to as the cause of the impaired water when, in fact, it could result from other sources. In addition to chemical components, the monitoring program should include channel conditions near culverts and long-term effects of surface disturbance on erosion in the PAPA.

4.14 Soil Resources

4.14.1 Scoping Issues

1. Address revegetation and restoration of short-term disturbance and long-term stabilization.
2. Soils in the area are highly susceptible to wind and water erosion - disturbance of vegetation can cause catastrophic damage from high winds and high intensity rainfall.
3. Minimize erosion from dust sources such as well pads, roads, and pipeline corridors.
4. Highly sensitive slopes should be exempted from production, or at least exceptional care should be taken to minimize densities of production sites in these areas.
5. Prohibit development on steep slopes on the margins of the Mesa, Ross Butte and Blue Rim. If development cannot be prohibited in these areas, well density should be severely limited in these areas.
6. No development should occur in areas difficult to reclaim.
7. No development should occur on unstable soils or on slopes in excess of 25 percent.

4.14.2 Significance Criteria. The project alternatives would cause significant impacts to soils if:

- disturbed areas are not adequately stabilized to reduce soil erosion and potential impacts to water quality; or
- there is increased erosion or reduced soil productivity to a level which prevents reestablishment of vegetative cover within five years.

One of the primary concerns related to soil resources is the potential for sedimentation to cause significant adverse impacts to area waters. These impacts were described in Section 4.13 and will not be repeated here.

4.14.3 Alternative Impacts

4.14.3.1 Summary of Impacts Common to All Alternatives (Except the No Action Exploration/Development Scenario). Potential impacts to soils from implementing any of the project alternatives include:

- increased wind and water erosion;
- loss of topsoil;
- decreased soil and vegetation productivity; and
- the introduction and invasion of noxious weeds.

Removal of vegetation and the exposure of soils during construction of well pads, roads and pipelines, along with the alteration and compaction of soils during construction, can increase runoff and wind and water erosion. Alteration of soil physical and chemical characteristics (e.g., compaction), dilution of topsoil (i.e., mixing of soil horizons) or the addition of contaminants from spilled materials decrease soil productivity. Sensitive soils (e.g., steep slopes, soils with high erosion potential, saline and/or sodic soils, shallow soils, soils with low reclamation potential or with high water tables) are more susceptible to impacts due to their limiting characteristics. For example, construction activities on steep slopes (greater than 15 percent) would require larger disturbed areas. They would also require longer and steeper cut and fill slopes which are difficult to successfully revegetate and stabilize, and in turn, have a greater erosion potential. These slopes can be difficult to return to their original contour during final reclamation.

Topsoil is a valuable resource in semi-arid areas such as the project area because soil development is slow. Topsoil provides a crucial plant-growth medium that is essential to establish successful revegetation. Topsoil is higher in organic matter, fertility and biologic activity than subsoil materials. Loss or dilution of the topsoil during construction by burial or mixing with subsoil horizons would reduce soil productivity and could hinder successful revegetation. Topsoil is generally much darker than subsoil materials. Consequently, topsoil is important during reclamation to help minimize visual impacts by reducing contrasts on reclaimed sites.

Impacts from erosion would be greatest after initial soil disturbance and would decrease naturally in the short-term due to natural stabilization through particle aggregation and armoring (i.e., formation of soil crusts and pavements). In general, most sediment in the PAPA is from exposed areas (i.e., stream channels and banks, badlands and bare escarpment slopes). The primary factors affecting sediment delivery or movement includes slope gradient, soil particle size, roughness of soil and vegetation cover. Currently, most sediment delivered to area waters would be derived from stream channel

erosion and degradation due to infrequent, high-intensity thunderstorms rather than from soil erosion away from channels (Harvey, *et al.*, 1985; Robinson, 1979; and BLM, 1995). Existing stock water impoundments in many of the drainages throughout the PAPA assist in sediment control by trapping sediment transported in runoff. Section 4.5 provides additional information on potential impacts from sediment on roads and the measures that would be implemented to reduce these impacts.

Severe impacts from wind erosion and fugitive dust include loss of soil productivity over time, reduced visibility which can affect traffic safety, and deposition of dust which can increase sedimentation and reduction in plant productivity. Soils with sand or loamy sand textures are the most susceptible to wind erosion (Donahue, *et al.*, 1977). According to ERO Resource Corporation (1988) and Case and Boyd (1987), soils with these textures have not been identified in the PAPA in any large areas. They were not identified during field verification surveys for this EIS. Never-the-less, when the soil surface is loose and dry, vegetation is sparse or absent and the wind is sufficiently strong (i.e., 13 mph at one foot above the ground surface), soil erosion will occur to some degree unless control measures are applied (SCS, 1989).

Locating well pads on sensitive soils would increase the total amount of disturbance in the PAPA because larger areas would need to be disturbed to accommodate each well pad. For example, according to Marshall (1998), a 3.3 acre well pad located on slopes of 15 percent would require approximately 4.5 acres of disturbance. If located on slopes of 25 percent, the same well pad would cause an increase in disturbance of about 36 percent. The increase in disturbance from siting wells on slopes between 15 and 25 percent is considered significant, especially considering the sensitive characteristics of these soils. These soils have a high runoff rate and erosion potential. The high runoff rate limits the effective moisture these soils receive and their shallow depth limits their water holding capacity. This causes them to be droughty thereby limiting their reclamation potential.

Saline soils occur in the PAPA on several landforms. Salts accumulate from soil weathering processes along some of the intermittent drainages (i.e., Alkali Creek, North Alkali Draw, Sand Springs Draw). Saline soils also occur in some areas along the flood plains of the New Fork and Green rivers

where high water tables limit soil drainage and salts are not leached from the soil profile. A few soils in the PAPA are derived from shale formations that have high salt content. Disturbance to these soils can be difficult to revegetate if proper reclamation procedures and seed mixtures are not utilized. Furthermore, disturbance to saline soils could increase erosion rates and salinity in the Green River.

Soils with high water tables are found on the flood plains of the Green and New Fork rivers. The water tables are typically high during the spring of the year and can be temporarily flooded. During wet periods, construction activities could damage these soils by rutting, mixing and compaction.

Table 4-36 provides the short- and long-term disturbance estimates for all of the alternatives. The disturbance estimates for all alternatives for both the Project Wide and Anticline Crest scenarios would be the same, however, the area impacted by these scenarios would be very different. Disturbance estimates are different when the mitigation measures are applied. Approximately 7,363 acres in the short-term and 1,382 acres in the long-term would be disturbed for the 500 Well Pad Development Level. The 700 Well Pad Development Level would disturb an additional 1,701 acres (23.1 percent) in the short-term and an additional 532 acres (38.5 percent) in the long-term. The additional disturbance from 200 well pads, associated roads and pipelines would increase the potential for soils to be impacted.

Table 4-36 Summary of Acres of Soils Disturbance for all Alternatives and Mitigation ¹		
	Short-Term Disturbance (acres)	Long-Term Disturbance (acres)
500 Well Pads	7,363	1,382
700 Well Pads	9,064	1,914
Pad Drilling Mitigation (RP Alternatives only)		
500 Well Pads	6,265	998
700 Well Pads	7,437	1,340
Centralized Facilities Mitigation (RP Alternatives only)		
500 Well Pads	7,483	1,244
700 Well Pads	9,234	1,706
¹ = Each alternative and mitigation would have the same amount of disturbance for the Project Wide or the Anticline Crest development scenarios. See Tables 2-9 through 2-14 for disturbance estimates for all project components.		

Short-term disturbance assumes that successful revegetation would be established within 3 to 5 years after reclamation. Successful revegetation is defined as the establishment of native herbaceous vegetation which can maintain itself, stabilize the site, and provide acceptable forage for livestock and wildlife similar to the pre-disturbed site. The short-term disturbance estimates assume that acceptable SWPPP/ERRPs are implemented as soon after disturbance as possible.

Compression. None of the potential compressor station sites are located on sensitive soils or on slopes greater than 15 percent. Construction at any of the compressor stations sites is estimated to disturb approximately 7 acres which would be a long-term impact because it would take these soils out of production for the life of the project. Proper topsoil salvaging during construction would minimize the loss of this valuable resource.

Sales Pipeline. The sales pipeline would potentially disturb approximately 2,906 acres in the short-term and would have no long-term disturbance since all disturbed areas would be reclaimed (see Tables 2-9 through 2-14). This disturbance assumes construction of a number of pipelines within a 200-foot wide corridor over the life of the project (see Section 2.5.7). Therefore, short-term disturbance from the sales pipeline at any one time would be much smaller than the 2,906 acres indicated. Because of the length of the sales pipeline (119.9 miles) potential soils impacts are likely. Therefore, it will be crucial to develop and implement a specific SWPPP/ERRP for the sales pipeline which incorporates the BLM measures for surface disturbing activities outlined in Appendix A. It is also important to ensure construction and reclamation compliance along with monitoring to ensure impacts are minimized, erosion is controlled and disturbed areas are successfully revegetated within 3 to 5 years.

BP Amoco Field Office. Construction of the BP Amoco Field Office would disturb 5 acres in the short- and long-term. Sensitive soils would not be impacted (see Figure 3-15). With topsoil salvaging and stabilization of all disturbed areas, impacts to soils are not anticipated as a result of construction of the field office.

4.14.3.2 Project Wide Exploration/ Development Scenario

Standard Stipulations Alternative. Although well pad disturbance to slopes greater than 25 percent would be avoided under this alternative, other soils within the Sensitive Soil SRMZ could be impacted by development (see Figure 3-15). These sensitive soils include soils that are on slopes less than 25 percent and are either exposed bedrock (Wasatch Formation) or are shallow to bedrock. There are approximately 9,781 acres of sensitive soils in the PAPA that have slopes less than 25 percent that could be disturbed by this alternative. There are 225 potential well pad locations that could be developed on these sensitive soils. The Blue Rim Area is about 12,880 acres in size (see Figure 3-15) and includes about 2,309 acres of badland soils which are included in the Sensitive Soils SRMZ. This alternative would only protect about 70 acres of soils in the Blue Rim Area (those that have slopes of 25 percent or greater).

This alternative would reduce disturbance to saline soils by avoiding well pads within 500 feet of perennial streams and riparian areas and within 100 feet of intermittent stream channels on Federal lands and minerals. However, a large portion of the saline soils in the PAPA occur on private lands and minerals along the flood plains of the Green and New Fork rivers. Therefore, a large amount of development on these soils could occur under this alternative. Additionally, these flood plains have large areas of soils that have high water tables and are temporarily flooded. Wyoming BLM Mitigation Guidelines (see Appendix A) would only slightly reduce disturbance to these soils because most of these soils occur on private lands and minerals.

RP Alternative on Federal Lands and Minerals.

This alternative would reduce the number of drill rigs operating in the PAPA from 8 to 5 and only 2 of these would be allowed to work on new locations at any given time north of the New Fork River on Federal lands and minerals. By minimizing the amount of disturbance exposed at any one time it should reduce the potential for erosion and sedimentation impacts. This RP Alternative would apply the following mitigation measures to protect soils on steep slopes and soils in the Blue Rim Area:

- **Steep Slopes:** within the Sensitive Viewshed SRMZ avoid disturbance of all project

components on slopes in excess of 15 percent on Federal lands and minerals.

- **Blue Rim Area:** On Federal lands and minerals development would be limited to 4 wells pads per section.

The steep slopes mitigation measure would greatly reduce the amount of disturbance to sensitive soils in the PAPA by avoiding development on 1,349 acres of soils that have slopes of 15 percent or greater within the sensitive viewshed SRMZ.

Minimizing disturbance in the Blue Rim Area would reduce potential impacts to sensitive soils. By limiting the number of well pads to 4 pads/section on Federal lands and minerals this alternative would reduce disturbance in approximately 95 percent of the Blue Rim Area.

This RP Alternative would reduce the potential for sediment and pollutants from impacting streams, wetlands and riparian areas by adopting a goal that would avoid uncontrolled runoff from leaving well pads within 1,000 feet of these areas. Runoff from well pads in these areas would be contained on site and evaporated or treated prior to leaving the well pad. Treatment would include passing runoff through a sediment trap or filtering structure to settle out any sediment. No hydrocarbons would be allowed to leave the well pad. Figure 4-7 provides a typical drawing of erosion controls that could be utilized in these situations.

The RP alternative would apply other mitigation measures to protect sensitive resources that would indirectly protect sensitive soils. For example, measures to protect deer winter range would avoid surface disturbance in the Mesa Breaks Management Area where there are approximately 2,992 acres of sensitive soils which is 35 percent of the sensitive soils in the PAPA north of the New Fork River.

Pad Drilling. Implementing pad drilling would reduce the total amount of short-term and long-term disturbance for the 500 Well Pad Development Level by about 1,068 acres (14.5 percent) and 384 acres (27.8 percent), respectively. Pad drilling with the 700 Well Pad Development Level would reduce the amount of short and long-term disturbance by 18 percent (1,627 acres) and 30 percent (574 acres), respectively. Reduced surface disturbance from fewer well pads, roads and pipelines would minimize both direct and indirect impacts to soils and minimize the potential for erosion and sedimentation. Pad

drilling reduces the amount of linear disturbances in the project area since there would be fewer wells pads that roads and pipelines would need to access. It is generally more difficult and costly to control erosion and sediment from linear disturbances because these features are wide-spread and cross numerous soil and topographic conditions. Inspection, monitoring and maintenance of these facilities typically requires more time.

Centralized Production Facilities. Using centralized production facilities with the 500 Well Pad Development Level would cause a slight increase in short-term disturbance of about 120 acres (1.6 percent). However, long-term disturbance would be reduced by about 138 acres (10 percent). For the 700 Well Pad Development Level, the use of centralized production facilities would increase short-term disturbance by about 170 acres (1.9 percent) and reduce long-term by about 208 acres (10.9 percent). The use of centralized production facilities allows for a larger area of each well pad to be reclaimed (because production facilities are not required), thereby reducing the long-term disturbance. It is not expected that the use of centralized production facilities will greatly reduce the potential for impacts to soils.

RP Alternative on All Lands and Minerals. This alternative describes how the resource protection measures, if applied to all lands and minerals, would minimize impacts to soils. In addition to the resource protection measures, this alternative would apply mitigation measures to avoid development on saline soils and temporarily flooded soils within the flood plains of the Green and New Fork rivers (see Table 2-8).

As with the RP Alternative on Federal Lands and Minerals this alternative would reduce the number of drill rigs operating in the PAPA from 8 to 5. Reducing the number of rigs operating in the PAPA at any one time would minimize the amount of disturbed areas that would be exposed reducing potential erosion and sedimentation impacts.

If the steep slopes resource protection measure is applied to all lands and minerals within the sensitive viewshed, this alternative would prevent disturbance to an additional 112 acres of these sensitive soils above and beyond the disturbance associated with the RP Alternative on Federal Lands and Minerals.

The Blue Rim Soil and Paleontology Mitigation Measure, if applied by this alternative, would reduce disturbance to an additional 635 acres of soils within the Blue Rim Area. If this mitigation measure is applied, potential impacts to sensitive soils would be reduced because only 4 well pads/section would be allowed in this SRMZ.

If the mitigation measure for 100-year flood plains is applied under the RP Alternative on All Lands and Minerals, the saline soils that are associated with high water tables within the Green and New Fork river flood plains would not be impacted. These soils would also be avoided if the Mitigation Measure for Saline Soils were applied by this RP Alternative. Compared to the SS Alternative and RP Alternative on Federal Lands and Minerals this alternative would have the largest potential to protect saline soils that occur in the PAPA within the Green and New Fork river flood plains because almost all of this area is privately owned. Although the 100-year flood plains have been delineated in the PAPA (see Figure 3-18) few soil surveys have been completed by the NRCS in these flood plains which could be utilized to identify these soils. Therefore, if the Saline Soils Mitigation Measure were applied, these soils would need to be identified on a case-by-case basis depending on proposed development in these flood plains. The operators would be responsible to ensure that these soils are identified by either utilizing the NRCS or by hiring a consultant.

Soils that have high water tables, are temporarily flooded or are hydric could be protected by several mitigation measures which this RP Alternative could apply on private and state lands in the PAPA (see Table 2-8). All of these mitigation measures would greatly reduce disturbance to these soils since these soils mainly occur on private lands along the Green and New Fork river flood plains in the PAPA. The 100-year flood plain mitigation measure would protect these sensitive soils because well pads would not be allowed within the flood plains of the Green and New Fork rivers. The 100-year flood plains of these rivers encompasses approximately 8,312 acres of non-Federal lands and minerals which is 89.9 percent of the total flood plain area. In these flood plains there are approximately 5,623 acres of wetlands that occur on non-Federal lands and minerals. These wetlands account for about 50 percent of the total 11,258 wetland acres that occur in the project area, based on USFWS NWI mapping. Disturbance to sensitive soils that have high water tables, are temporarily flooded or are hydric would also be greatly reduced if the BLM's

Mitigation Guidelines are applied to private and state lands in the PAPA. These guidelines would avoid well pads within 500 feet of perennial streams, wetlands and riparian areas and 100 feet of ephemeral or those intermittent streams that do not exhibit riparian characteristics. Application of these guidelines would reduce the potential for erosion and sedimentation impacts to approximately 205 miles of intermittent and 58 miles of perennial streams that occur on non-Federal lands in the PAPA. The mitigation measure for temporarily flooded soils, if applied by this RP Alternative would avoid development of these soils on private and state lands within the Green River and New Fork River flood plains. To delineate these areas, a definition of temporarily flooded would need to be established by specifying the frequency of the flooding period (i.e., every 2 to 5 years, 10 years, etc.). After the flooding frequency is established these areas could then be modeled and mapped to determine where this measure would apply.

Pad Drilling. Pad drilling would have the same impact reduction as described for the RP Alternative on Federal Lands and Minerals because the reduction in surface disturbance would be the same.

Centralized Production Facilities. The use of centralized production facilities would not greatly reduce the potential for impacts to soils resources.

4.14.3.3 Anticline Crest Exploration/Development Scenario

Standard Stipulations Alternative. The Anticline Crest scenario would potentially have the same amount of disturbance as the Project Wide Scenario, but disturbance would be confined to the crest of the anticline (see the footnote to Table 4-29). The Project Wide Scenario assumed that development would occur throughout the entire 197,345 acre project area. Development under the Anticline Crest Scenario would occur in the area concentrated along the anticline crest shown on Figure 2-1 which is about 64,505 acres, about one third the size of the project area. Although surface disturbance would be concentrated in one area, the Anticline Crest Scenario would minimize disturbance to sensitive soils in the PAPA for the following reasons.

- Development along the anticline would reduce the disturbance to flood plains and sensitive soils with

high water tables or which are temporarily flooded because the anticline crest encompasses a much smaller area of these soils compared to the Project Wide Scenario. For example, the Anticline Crest Scenario would cover only an approximate 2 to 3 mile band of these soils along the New Fork River in the vicinity of T. 31 N., R. 109 W. Sections 10, 11, 12, 14 and 15. This area encompasses approximately 1,417 acres of flood plains along the Green River and New Fork River which is only 15 percent of the entire PAPA which is 9,254 acres.

- Reducing the amount of disturbance to these flood plains would, in turn, reduce the amount of saline soils that could potentially be disturbed in the project area. Because a smaller area of these soils would be potentially impacted.
- The Anticline Crest Scenario would reduce the potential disturbance within the Blue Rim Area because the anticline crest does not encompass the entire Blue Rim Area as would the Project Wide Scenario. Of the 12,880 acres contained in the Blue Rim Area the Anticline Crest Scenario only encompasses about 4,438 acres or 34 percent of this area. In the entire Blue Rim Area there are approximately 2,314 acres of sensitive soils or badlands (see Figure 3-15) whereas the anticline crest area contains about 617 acres or only about 14 percent of these soils.
- Compared to the entire PAPA which contains approximately 9,781 acres of sensitive soils that have slopes less than 25 percent that could be potentially impacted by the Project Wide Scenario, the Anticline Crest Scenario contains less than half or 4,274 acres of these soils. Under the Project Wide Scenario there are 225 potential well pad locations that could be developed on sensitive soils whereas under the Anticline Crest Scenario there are 98 potential well pad locations that could be developed on these soils.

Although disturbance estimates are assumed to be the same for both the Project Wide and Anticline Crest scenarios, actual disturbance could be less with the Anticline Crest Scenario. This is because road and pipeline lengths should be shorter due to concentrated development along the anticline crest and not throughout the entire project area.

RP Alternative on Federal Lands and Minerals. The mitigation measures that would be applied by the RP Alternative on Federal Lands and Minerals would further reduce impacts. Combining the RP Alternative's mitigation measures with anticline

crest development, impacts to sensitive soils would be further reduced. For example, along the anticline crest there are 4,274 acres of sensitive soils which is less than half of those that occur in the Project Wide area. Of these sensitive soils that occur along the anticline crest, 24 percent or 1,016 acres of these soils occur within the sensitive viewshed SRMZ which would avoid well pad development on slopes in excess of 15 percent.

This alternative would further reduce impacts to soils in the Blue Rim Area compared to the SS Alternative because the Blue Rim Soil and Paleontology mitigation measure would be applied to 3,827 acres or 86 percent of this area. This mitigation measure would limit the well pad density to 4 pads/section.

Pad Drilling. Pad drilling would have the same reductions in disturbance and impacts as described for the Project Wide Scenario. However, the disturbance would be minimized within the anticline crest area.

Centralized Production Facilities. Centralized production facilities would cause a slight increase in short-term disturbance and would reduce long-term disturbance in the PAPA by about 10 percent. Therefore, the use of centralized production facilities does not greatly reduce impacts to soils.

RP Alternative on All Lands and Minerals. Impacts to sensitive soils would be reduced if the mitigation measures that were applied to Federal lands and minerals were also applied to private and state lands in the PAPA. Compared to the RP Alternative on Federal Lands and Minerals, applying the mitigation measure for steep slopes to all lands and minerals would avoid development of 31 additional acres of soils that occur within the sensitive viewshed which have slopes in excess of 15 percent.

If the mitigation measures for the Blue Rim Soils Area were applied to all lands and minerals an additional 610 acres in this SRMZ would have reduced disturbance. This alternative could also implement mitigation measures that would protect saline and temporarily flooded soils that occur within the flood plains of the Green and New Fork rivers in the anticline crest area. For example, within the 1,417 acres of 100-year flood plains that occur in this area, 1,037 acres or 73 percent are privately owned.

Pad Drilling. Pad drilling would have the same impact reductions as described for the Project Wide

Scenario, RP Alternative on Federal Lands and Minerals because the reductions in surface disturbance would be the same. It should be pointed out that compared to all of the alternatives and development scenario, implementation of this alternative with pad drilling mitigation would cause the least impacts to soils in the PAPA for the following reasons:

- this development level and pad drilling would cause the least amount of short and long-term disturbance;
- surface disturbance and impacts would be concentrated along the anticline crest and not throughout the PAPA which would prevent potential disturbance to some areas of sensitive soils in the PAPA; and
- mitigation measures if applied to all lands and minerals would further reduce potential impacts to sensitive soils within the anticline crest area.

Compared to the 700 well development scenario pad drilling would reduce the amount of short and long-term disturbance by 18 percent (1,627 acres) and 30.0 percent (574 acres), respectively. This reduction in surface disturbance would greatly minimize potential impacts to soils. Comparing the 700 well development level to the 500 well development level without pad drilling this development scenario would only have about a 1 percent increase (74 acres) in short-term disturbance and an increase of just over 3 percent (42 acres) in long-term disturbance (see Table 4-36).

Centralized Production Facilities. The use of centralized production facilities is not expected to greatly reduce impacts to soils.

4.14.3.4 No Action Exploration/Development Scenario. Implementation of this alternative would eliminate all potential impacts to soils.

4.14.4 Additional Mitigation Opportunities. There are additional mitigation measures which should be implemented to further reduce erosion and impacts to soils. The BLM can impose the following mitigation measures on Federal lands. Adoption of these measures on private or state lands would be required by other governmental entities or would be strictly voluntary on the part of the operator.

Soils Mitigation Opportunity 1. Implementation of an adequate SWPPP/ERRP is critical to reduce

potential project-related impacts to soils. The SWPPP/ERRP should address topics outlined in Appendix A and include appropriate BMPs to reduce impacts from storm water runoff and subsequent sedimentation. BMPs are discussed in Section 4.13. Appendix H contains BMPs appropriate for the project activities addressed in this EIS. During preparation of the SWPPP/ERRPs, the following potential conditions should be addressed:

Steep slopes. Final alignments of road and pipeline routes should be examined in the field to insure that construction on slopes in excess of 15 percent are avoided to the extent feasible. Where construction-related disturbance cannot be avoided, detailed design and reclamation plans should be required by BLM to insure that cut and fill slopes are minimized and that slopes are stable. Detailed drainage design plans should be required for roads constructed on slopes in excess of 15 percent to insure that runoff is adequately controlled and conveyed and that appropriate BMPs are installed to prevent sedimentation.

Saline and sodic soils. While impacts to saline and/or sodic soils are indirectly reduced by the alternatives by avoidance of stream channels, additional mitigation measures necessary to reduce impacts should include the following:

- well pad design should include sediment traps at discharge sites to prevent any downstream movement of sediment (see Figure 4-7);
- appropriate BMPs shown in Appendix H should be installed to prevent sediment movement from disturbed areas adjacent to streams; and
- species adapted to saline or sodic conditions should be used to enhance revegetation success (Table 4-37).

Soils with low reclamation potential. Mitigation measures necessary to minimize impacts to these soils and to enhance revegetation success should include the following:

- disturbance should be minimized to the smallest area necessary for safe construction;
- topsoil should be salvaged for use in reclamation;
- identify soil factors in the SWPPP/ERRP affecting revegetation and select a proper seed mixture;
- insure that proper revegetation procedures are used (e.g. scarification, seedbed preparation, seeding methods and seeding dates); and

Table 4-37
Recommended Seed Mixture on Saline/Sodic Soils

Species	Variety	Drill Seeding Rate Lbs/Acre (PLS)
Western wheatgrass	Rosanna	4.0
Sandberg bluegrass		2.0
Indian ricegrass		3.0
Bottlebrush squirreltail		1.0
Alkali sacaton		1.0
Saltgrass		1.0
Scarlet globe mallow		1.0
Gardner saltbush		2.0
Shadscale		2.0
Total		17.0

- two tons per acre of suitable mulch should be applied where appropriate and cleared vegetation should be returned to reclaimed areas to conserve soil moisture.

Soils with a high water table. Mitigation measures which could reduce impacts to these soils include:

- delay construction until the dry periods;
- conduct soils tests, where necessary, to insure that road and well pad designs incorporate base materials which are sufficient to support traffic and well pad loads;
- use geotextile fabrics, where necessary, to support the road base;
- use a closed mud system during drilling where water shows in the rat hole. Require construction of a rat hole (40 ft deep) prior to construction of the reserve pit in order to determine use of a closed mud system. If no water shows, then a closed mud system is not required;
- salvage twelve inches of topsoil in areas that are not saturated because many of these areas are wetlands. This is necessary for proper revegetation because the topsoil will provide important seed/root propagules that are not commercially available. This is a general condition for many of the COE Nationwide Permits and should be applied to construction of well pads in these temporarily flooded soils; and
- species adapted to wetlands and/or soils with a high water table should be used to enhance revegetation success (see Table 4-38).

Species	Variety	Drill Seeding Rate Lbs/Acre (PLS)
Tufted hairgrass		2.0
Basin wildrye		5.0
Slough grass		6.0
Blue joint reedgrass		3.0
Alkali sacaton		1.0
Total		17.0

Soils Mitigation Opportunity 2. During project construction and reclamation it will be critical to ensure that these activities are in compliance with BLM's Mitigation Guidelines (Appendix A) and with the SWPPP/ERRP's. Compliance with these guidelines and plans will ensure that impacts are minimized, erosion is controlled and disturbed areas are successfully revegetated within 3 to 5 years. The operators should ensure adequate compliance and monitoring is being performed by designating personnel, or contracting with an outside party, that would be responsible for these activities.

Soils Mitigation Opportunity 3. During the APD process, well pads, roads and pipeline locations in the vicinity of the sensitive soils shown on Figure 3-15 should be verified in the field to insure that direct and indirect impacts are minimized.

Soils Mitigation Opportunity 4. The design standards and mitigation measures for roads (Section 4.5) to minimize disturbance and erosion should be applied to insure that significant impacts do not occur.

Soils Mitigation Opportunity 5. Where possible, clearing of pipeline rights-of-ways should be accomplished with the least amount of disturbance to topsoil. This would be accomplished by scalping vegetation at the ground surface and leaving root systems intact. Staking of rights-of-ways would prevent disturbance off the right-of-ways. On ditches exceeding 36 inches in width, topsoil should be salvaged, where possible, across the entire right-of-way. Topsoil salvaging should occur on all areas where grading is required. Where topsoil salvaging occurs, it should be wind-rowed on the edge of the right-of-way and not allowed to mix with the trench spoil. Potential topsoil salvage depths for the sales pipeline along the existing pipeline corridor have been recommended by the BLM (1998a) and should be

utilized in future plans of development. Trench backfill should not extend above the original ground level after the fill has settled. In the PAPA and along the sales pipeline where soils have a significant rock content, trench backfill should be compacted. A crown should not be placed over the trench in anticipation of settlement because these soils don't typically settle. Waterbars should be installed in sloping terrain (see Appendix H). Bladed vegetation materials should be respread over the right-of-way once construction is complete. Mulching should be required on soils with low reclamation potential or when erosive. All slopes greater than eight percent should be evaluated for mulching. Banks of stream crossings should be returned to their approximate original contour or shaped to minimize erosion. Silt fences or other sediment barriers should be installed at stream crossings to prevent sedimentation. These stream areas may need to be fenced to eliminate grazing and to insure reclamation success. Throughout the PAPA, surface pipelines should be considered where steep slopes are traversed (greater than 15 percent).

Soils Mitigation Opportunity 6. The SWPPP/ERRP should address controls to minimize wind erosion. This includes minimizing disturbance, constructing low profile stockpiles, careful siting of stockpiles and leaving reclaimed surfaces in a rough condition to accomplish seeding and mulching. Road and well pad surfacing materials, watering and chemical binding agents which would minimize fugitive dust from these exposed surfaces should be addressed.

Soils Mitigation Opportunity 7. The SWPPP/ERRP should address the following procedures to insure that all disturbed areas are stabilized and that revegetation efforts are enhanced so that significant impacts do not occur.

Scarification. Prior to revegetation, all compacted surfaces should be scarified by ripping or chiseling to loosen compacted soils. Scarification promotes water infiltration, better soil aeration and root penetration. Scarification should be done when soils are dry to promote shattering of compacted soil layers.

Seedbed Preparation. Proper seedbed preparation is critical for seed establishment. Seedbed preparation should be conducted immediately prior to seeding to prepare a firm seedbed conducive to proper seed placement and moisture retention. Seedbed preparation should also be performed to break up

surface crusts and to eliminate weeds which may have developed between final grading and seeding. In most cases, chisel plowing is sufficient because it leaves a surface smooth enough to accommodate a drill seeder pulled by a tractor and rough enough to catch broadcast seed and trap moisture and runoff.

Seed Mixtures. Seed mixtures should be specified on a site-specific basis and their selection should be justified in the SWPPP/ERRP in terms of local vegetation and soil conditions. The recommended general seed mixtures provided on Tables 4-37 through 4-39 were developed from observation of successful revegetation in the Jonah II Field and observation of the dominant native species in the project area. These mixtures comply with EO 11987.

Species	Variety	Drill Seeding Rate Lbs/Acre (PLS)
Thickspike wheatgrass	Critana	4.0
Western wheatgrass	Rosanna	4.0
Indian Ricegrass		4.0
Bitterbrush		1.0
Scarlet globe mallow		1.0
Winterfat		2.0
Fourwing saltbush		1.0
Total		17.0

Native species which should be considered include bluebunch wheatgrass, streambank wheatgrass, bottlebrush squirreltail, needle-and-thread grass and big sagebrush. Use of any introduced species would require prior approval by the BLM. The WGFD recommends that BLM consider shrub species in seed mixtures. BLM should coordinate with WGFD to insure that the correct shrub species are incorporated into seed mixtures on Federal lands.

Fall seeding should occur from about October 1 to November 15 or until ground freeze or snow pack prevents critical seed soil coverage. Spring seeding should be completed by May 1 or as directed by the BLM. Seed should be used within 12 months of testing.

Seeding Method. Drill seeding should be used where the terrain is accessible by equipment. During drilling, the seed should be planted in a range of 1/4 to 1/2 inches. The seed should be separated by boxes

to prevent seed from separating due to size and weight. Rice hulls or other appropriate material should be added to the seed as necessary to prevent separation. The drill should be properly calibrated so that seed is distributed according to the rates specified for each seed mix.

On areas too steep for drill seeding or where approved by the BLM, broadcast seeding may also occur. Broadcasted seed should occur onto a rough seedbed and then should be lightly harrowed, chained or raked to cover the seed. The seeding rate should be doubled for the recommended seed mixtures because the mixtures were developed for drill seeding. The method used to cover the seed should be selected so that the seed is lightly covered but maintains the surface in a rough condition. The broadcast seeder should be properly calibrated or the seeding should occur over a calculated known area so that the proper seeding rate is applied.

Mulching. Where mulching is deemed necessary, a certified weed-free straw or hay mulch should be crimped into the soil at an application rate of two to four tons per acre. Mulches should be applied by blowers, spreaders or by hand. The mulch should not be finely shredded during application and mulch strand lengths should be long enough to be anchored by crimping. The mulch should be spread uniformly over the area so that 75 percent or more of the surface is covered. Mulch should be crimped to a depth of two to three inches.

Soils Mitigation Opportunity 8. The alignment of the sales pipelines in portions of the existing corridor could be buffered so that the pipeline rights-of-way do not remove all the native vegetation between the pipelines. By maintaining a native vegetation buffer of about 10 to 15 feet between the pipelines, an important seed source for the establishment of shrub species would be maintained (MacDonald, 1999).

4.14.5 Monitoring Recommendations. Inspections of the revegetation efforts should be conducted after the second and fourth growing seasons to evaluate success. The need to reseed, fertilize or spot treat should be determined by the operator and the BLM. Successful revegetation should be based on the ability of the vegetation to stabilize reclaimed sites and to provide livestock and wildlife forage. If reseeding is judged to be necessary, based on vegetation density and composition of adjacent areas, the SWPPP/ERRPs should be reviewed for any necessary changes to

improve revegetation success. Results of the monitoring efforts should be presented at the annual meeting.

In accordance with EO 13112, if invasive or non-native species infest disturbed sites they should be controlled by mechanical, chemical, biological or other methods which are approved by BLM and the local weed control agency. Herbicide use should be avoided in all areas near water and special status plant populations.

4.15 Vegetation Resources

4.15.1 Scoping Issues. There were no concerns regarding vegetation expressed during public scoping. Issues involving vegetation centered on grazing resources, wetlands and riparian resources, and wildlife and aquatic resources.

4.15.2 Significance Criteria. Impacts produced by the alternatives would be considered significant if:

- within five years, reclaimed areas do not attain adequate vegetation cover and species composition to stabilize the site and to support pre-disturbance land uses including livestock forage and wildlife habitat and big game population objectives; or
- there is invasion and establishment of noxious nonnative weeds that contributes to unsuccessful revegetation.

Significant impacts could occur from any of the project alternatives if adequate revegetation measures are not implemented and monitored to insure successful revegetation. Proper implementation of the revegetation measures specified in Section 4.14.4 are necessary to insure that significant impacts do not occur.

4.15.3 Alternative Impacts

4.15.3.1 Summary of Impacts Common to All Alternatives (Except the No Action Exploration/Development Scenario). The extent of vegetation types and their proportional occurrences on the anticline crest and project-wide areas are listed in Table 4-40. Potential impacts to vegetation from all project alternatives include removal of native vegetation during construction of well pads, roads, and pipelines. Though interim reclamation of well pads, pipeline rights-of-way, and road shoulders

would occur, the shrub overstory at those sites would not be restored for some time. Sagebrush, the predominant shrub within the project area, may take 10 to 20 years to become reestablished and therefore, surface disturbances to sagebrush steppe vegetation may adversely affect wildlife species that depend on sagebrush for some life history function.

In general, the extent of impacts produced by removal of vegetation would be influenced by precipitation and soil characteristics. Mean annual precipitation in the PAPA is about 10 inches with much of the moisture accumulating during winter when plant growth cannot occur or is minimal. Other areas, those having shallow or exposed subsoils and those where soils are highly alkaline, would be difficult to revegetate.

Undisturbed ground is covered by microphytic crusts (growths of lichens, algae, mosses, fungi or bacteria on the soil surfaces) which are readily destroyed by vehicles and trampling, thereby increasing erosion potential and suitability for invasions by nonnative weeds (Knight, 1994). Cheatgrass and halogeton are exotic species that have invaded and halogeton is poisonous to livestock (West, 1988). Cheatgrass out-competes native grasses and could become dominant. Increased fuel loads as a consequence of cheatgrass invasion heighten susceptibility to wildfires which, when frequent, destroy native shrubs, forbs and grasses, but not cheatgrass. Severe soil erosion and soil nutrient loss after precipitation has contributed to the degradation of sagebrush steppe and are consequences of cheatgrass invasion in the Intermountain west (West, 1988). Although these species have invaded many areas throughout the west, they have not created serious problems in the project area.

Introduction of other noxious weeds following removal of native vegetation is a potential impact that would further limit reestablishment of native species. As examples, Canada thistle, Russian knapweed, and perennial pepperweed can form dense stands that, because of deep, extensive root systems, are difficult to eliminate; musk thistle and spotted knapweed invade pastures, roadsides, ditches, and rangeland forming dense stands that crowd out desirable species; Dyer's woad first invades disturbed soils then spreads to rangelands and regenerates from roots if mowed; hoary cress becomes established on disturbed alkaline soils and out-competes other species; black henbane is poisonous and leafy

Table 4-40
Area and Proportional Cover of Vegetation Types Affected on the Anticline Crest and Project Wide on the PAPA.

Vegetation Type	On Anticline Crest		On PAPA	
	Area (acres)	Percent of Anticline	Area (acres)	Percent of PAPA
Sagebrush Steppe	51,842	80.4	146,535	74.3
Mixed grass prairie	4,563	7.1	12,132	6.1
Greasewood flats	801	1.2	1,864	0.9
Desert shrub	3,353	5.2	11,622	5.9
Riparian forest and shrub	657	1.0	4,334	2.2
Other limited types	153	0.3	322	0.2
Barren ground	395	0.6	1,416.5	0.7
Irrigated cropland	2,546	3.9	17,616.5	8.9
Human settlement	194	0.3	1,503	0.8
Total	64,504	100.0	197,345	100.0

spurge causes severe irritation to cattle's mouths and digestive systems (Whitson *et al*, 1996).

The fragmentation of the steppe by project facilities will increase opportunities for introduced weeds to invade an ecosystem dominated by native species. If noxious weeds infest disturbed sites, the operators would be responsible to insure they are controlled by mechanical, chemical, biological or other methods which are approved by BLM and the local weed control agency. Herbicide use would be avoided in all areas near water and special status plant populations.

Certain native species of vegetation such as rabbitbrush and rhizomatous wheatgrass will invade disturbed areas. For about 10 years after reclamation, there will be more grass and forbs and less sagebrush.

Compression. Construction at any one of the proposed compressor station sites would disturb approximately 7 acres of vegetation in the long-term. Jonah Gas' proposed sites in Section 3, T. 31 N., R. 109 W. and Section 36, T. 30 N., R. 108 W. are located in the sagebrush steppe vegetation type. The proposed site in Section 3 may also disturb some mixed grass prairie vegetation. Western Gas's proposed sites in Section 4, T. 30 N., R. 108 W. and Section 34, T. 29 N., R. 108 W. are located in the mixed grass prairie and sagebrush steppe types, respectively. Ultra's proposed compressor station site is located in the sagebrush steppe type in Section 16, T. 31 N., R. 108 W.

Sales Pipeline. Vegetation disturbed by the sales pipeline would primarily occur within the sagebrush steppe and desert shrub types. Areas that have been previously reclaimed along the existing pipeline corridor would also be disturbed. There would be no long-term disturbance associated with the sales pipelines because all disturbed areas would be reclaimed immediately after construction. Riparian areas occur at the Green River and Blacks Fork crossings. Cottonwoods and willows are present at the Green River crossing while willow and hawthorn are present at the Blacks Fork crossing.

BP Amoco Field Office. Construction of the BP Amoco Field Office would disturb 5 acres of sagebrush steppe vegetation over the short- and long-term.

4.15.3.2 Project Wide Exploration/Development Scenario

Standard Stipulations Alternative. BLM's standard stipulations do not apply to vegetation, *per se*, but are designed to protect key areas for other resources (Table 2-8) and by doing so, some of the vegetation throughout the project area would also be protected from any surface disturbances. Since locations of the individual well pads, pipelines and roads under this and any of the other alternatives are unknown, it is not possible to predict the extent of disturbance to any particular vegetation type. But, it seems likely that the amount of disturbance project-wide to any specific vegetation type would be proportional to the extent of that type. Consequently, sagebrush steppe covers 146,535 acres of the project

area and would be expected to be most affected and the other, limited vegetation types (mountain shrub, limber pine, and aspen) covering 322 acres would be least affected (see Table 4-40 for areas and percent cover of major vegetation types in the project area).

More vegetation within any given type would be disturbed for the 700 well pad development level than for the 500 well pad development level. Short-term impacts due to surface developments would clear 9,064 acres of vegetation under the 700 well pad development level (see Table 2-9) but only 7,363 acres would be cleared if 500 producing well pads were developed (see Table 2-10). Once disturbed areas on well pads, pipelines and road shoulders have been reclaimed, the amount of cleared, exposed ground would diminish but would persist over the long-term. Development of 500 well pads would leave 1,382 acres of bare ground at producing well pads and road surfaces (see Table 2-10) while 1,914 acres of bare ground would remain after 700 well pads are in production (see Table 2-9).

An average of 8 drilling rigs could be operating across the PAPA throughout the year under this alternative. Therefore, the amount of soils exposed at any one time could be more substantial than with the limitations to drilling rigs under either of the two RP alternatives, below. With extensive areas of exposed soils, the potential for widespread infestations of noxious, nonnative weeds would appear to be more likely than if areas with surface disturbance were limited and confined.

RP Alternative on Federal Lands and Minerals.

Resource protection measures developed for this alternative would not directly affect vegetation types but, similar to the application of standard stipulations above, measures designed to avoid well pads or limit well pad densities for other resources (see Table 2-8 for resource-specific protection measures) would also limit well pad locations in specific geographic locales and reduce effects of pad, road and pipeline construction in vegetation covering those sites. With resource protection measures that require limits to well pad densities on Federal lands and minerals, the expected distribution of surface disturbances and impact to vegetation across the landscape would be much more dispersed under this alternative than under the Standard Stipulations Alternative.

The overall acreage affected by short-term and long-term impacts from clearing vegetation under this alternative would be identical to those noted under the

SS Alternative, above. The only anticipated difference between the two alternatives would be levels of disturbances in each vegetation type and the amount of dispersion of disturbance, but those effects cannot be evaluated without knowing exact locations of each well pad.

This alternative specifies that no more than 5 drilling rigs would be present, project-wide, and only 2 rigs would be operating north of the New Fork River at any one time. But this limitation applies only to Federal lands and minerals. With reduction in the number of drilling rigs in operation below the 8 rigs that would be allowed under the SS Alternative, the amount of vegetation disturbed at any one time would be less. Conceivably, previously disturbed areas would be under different stages of reclamation and revegetation so that by limiting the amount of active drilling, the amount of exposed bare ground would be consistently less over time. This could be advantageous in preventing widespread infestations of noxious, nonnative weeds.

Pad Drilling. On areas where no standard stipulations or resource protection measures apply to either avoid wells or limit well pad density, up to 16 well pads/section could be developed at single well pads. But in other areas where resource protection measures limit well pad densities to 2, 4 or 8 pads/section, multiple wells could be drilled from individual pads. To achieve the 700 producing well pad development level, 360 wells could be drilled on 90 well pads, assuming 4 wells could be drilled from one well pad. The remaining 340 producing wells are assumed to be drilled from single well pads. Short-term surface disturbances due to well pads, roads and pipelines computed for the pad drilling option amount to 7,437 acres (Table 2-11), 1,627 acres less disturbance to vegetation than either the SS Alternative or the RP Alternative on Federal Lands and Minerals. Similarly, short-term acreage of vegetation lost for the 500 well pad development level would be 6,265 acres, (1,098 acres less disturbance to vegetation than the previous two alternatives). Estimated long-term loss of vegetation would range from 998 acres at the 500 well pad development level to 1,340 acres at the 700 well pad development level (between 384 acres and 574 acres less than the previous two alternatives).

Centralized Production Facilities. Implementation of centralized production facilities in any of the vegetation types on the project area has the potential to increase short-term impacts: up to 16 well pads/

section could be developed on any area that was not subject to complete avoidance of surface disturbance by a standard stipulation and/or resource protection measure. Each centralized production facility, located at one of the well pads, would disturb 5 acres over the short- and long-term. However, an area surrounding each of the well pads developed under this plan could be reclaimed so that only 0.5 acre would remain disturbed over the long-term.

Project wide short-term disturbance to vegetation under this option would be slightly more than the amount disturbed under the SS Alternative and RP Alternative, above, for either of the two well development levels (compare Tables 2-9 and 2-10 with Tables 2-13 and 2-14). But overall long-term disturbances to vegetation would be from 246 acres to 366 acres less than those alternatives. Implementation of this option would affect more vegetation over the short- and long-term than under the pad drilling option (compare Tables 2-11 and 2-12 with Tables 2-13 and 2-14). However, the increased short-term surface disturbance expected under this option would increase the risk of weed infestations and reduce revegetation success above risk levels present under the pad drilling option and other alternatives, above.

RP Alternative on All Lands and Minerals. Resource protection measures developed for the RP Alternative on Federal Lands and Minerals would apply to state and private lands and minerals across the PAPA. Stipulations and measures designed to avoid well pads or limit well pad densities for other resources (see Table 2-8) would also limit well pad locations in specific geographic locales and reduce effects of well pad, road and pipeline construction in vegetation covering those sites. But, with resource protection measures applying to all lands and minerals the expected distribution of surface disturbances and impact to vegetation across the landscape would be much more dispersed under this alternative than potential dispersion under SS and RP alternatives on Federal lands and minerals.

The overall acreage affected by short-term and long-term impacts from clearing vegetation under the RP Alternative on All Lands and Minerals would be identical to those noted under the Standard Stipulations Alternative and RP Alternative on Federal Lands and Minerals, above. The only anticipated differences between the three alternatives would be levels of disturbances in each vegetation type and the amount of dispersion of disturbance, but those effects

cannot be evaluated without knowing exact locations of each well pad.

As discussed above under the RP Alternative on Federal Lands and Minerals, no more than 5 drilling rigs would be present, project-wide, and only 2 rigs would be operating north of the New Fork River at any one time. That limitation would apply all lands and minerals under this alternative. With reduction in the number of drilling rigs project wide, the amount of vegetation disturbed at any one time would be less which would limit the amount of exposed bare ground over time. Wide spread infestations of noxious, nonnative weeds would be less likely if areas of older surface disturbances were under various stages of reclamation than if many areas in a locale were exposed at the same time.

Pad Drilling. On areas where no standard stipulations or resource protection measures apply to either avoid wells or limit well pad density, up to 16 well pads/section could be developed at single well pads. But in other areas where resource protection measures limit well pad densities to 2, 4 or 8 pads/section, multiple wells could be drilled from individual pads. With limited well pad densities applied to all lands and minerals, the geographic distribution of disturbance due to pad drilling is expected to be more dispersed than under other alternatives and options. However, estimates of short-term and long-term impact to vegetation would be the same as for the pad drilling option under the RP Alternative on Federal Lands and Minerals.

Centralized Production Facilities. Development of centralized production facilities in any of the vegetation types on the project area has the potential to increase short-term impacts but decrease long-term impacts. By drilling up to 16 well pads/section on lands that would otherwise be subject to limited pad densities, the expected dispersion of surface disturbances to vegetation would be comparable to distributions envisioned under the Standard Stipulations Alternative. But, the long-term disturbance would be decidedly less than on any other alternatives, including the Centralized production facilities option in the RP Alternative on Federal Lands and Minerals because more of the project area would be available for implementing this option. As noted under the discussion of this option in the RP Alternative on Federal Lands and Minerals, increased surface disturbances under any scenario and any of the alternatives would increase the risk of weed infestations and reduced revegetation success.

That same risk would be present here. But with the limitation on the number of drilling rigs that could be present, the amount of soils exposed at any one time would be limited and reduce the chance for widespread establishment of weeds.

4.15.3.3 Anticline Crest Exploration/Development Scenario. The anticline crest covers approximately 64,505 acres within the PAPA. The extent of vegetation types and their proportional occurrences on the anticline crest and project-wide area are listed in Table 4-40.

Standard Stipulations Alternative. Some of the vegetation on the anticline crest would be protected from any surface disturbances by standard stipulations that protect other resources. If the amount of disturbance project-wide to any specific vegetation type would be proportional to the extent of that type, the absolute amount of disturbance in sagebrush steppe within the anticline crest would probably be greater than disturbances dispersed over the project-wide area simply because a larger proportion of the anticline crest is covered with sagebrush steppe than the overall project area (see Table 4-40). With the expected time of 10-20 years for sagebrush to become reestablished, impacts to that vegetation type could be slightly more significant for the various alternatives under the Anticline Crest Scenario than under the Project Wide Scenario.

More vegetation within any given type on the anticline crest is expected to be disturbed for the 700 well pad development level than for the 500 well pad development level. Short-term impacts due to surface developments clearing vegetation under the 700 and 500 producing well pad development levels are expected to be the same as under the Project Wide Scenario. However, the overall surface disturbance would be much more concentrated under the Anticline Crest Scenario. For the 700 well pad development level, short-term disturbance of 9,064 acres would affect 14.1 percent of the anticline crest area but only 4.6 percent of the project wide area. Similar differences exist for the 500 well pad development level.

RP Alternative on Federal Lands and Minerals. Resource protection measures developed for this alternative would avoid well pads or limit well pad densities for other resources and so regulate well locations within vegetation types on the anticline crest. With all of the 700 or 500 producing well pads

focused on the anticline crest, the overall well pad and road density in that defined area would be greater than under the Project Wide Scenario. But, because of standard stipulations and resource protection measures, expected well pad densities would be less than under the SS Alternative in the Anticline Crest Scenario, above.

The overall acreage affected by short-term and long-term impacts from clearing vegetation under the RP Alternative would be identical to those noted under the SS Alternative under either exploration/development scenario. The only anticipated differences among alternatives and scenarios would be levels of disturbances in each vegetation type and the amount of dispersion of disturbance, but those effects cannot be evaluated without knowing exact locations of each well pad.

Pad Drilling. On areas on the anticline crest where no standard stipulations or resource protection measures apply to either avoid wells or limit well pad density, up to 16 well pads/section could be developed on single well pads. But in other areas where resource protection measures limit well pad densities to 2, 4 or 8 pads/section, multiple wells could be drilled from individual pads. With limited well pad densities applied to Federal lands and minerals, the geographic distribution of disturbance due to pad drilling is expected to be more dispersed than under other alternatives and options. However, estimates of short-term and long-term impact to vegetation will be the same as for the pad drilling option under the RP Alternative on Federal Lands and Minerals for the Project Wide Scenario.

Centralized Production Facilities. Development of centralized production facilities in any of the vegetation types on the project area has the potential to increase short-term impacts but decrease long-term impacts. By drilling up to 16 well pads/section on Federal lands and minerals that would otherwise be subject to limited pad densities, the expected dispersion of surface disturbances to vegetation would be comparable to distributions envisioned under the SS Alternative. But, the long-term disturbance would be decidedly less than on any other alternatives, including the RP Alternative on Federal Lands and Minerals because more of the project area would be applicable for implementing this option.

RP Alternative on All Lands and Minerals. Resource protection measures developed for the RP

Alternative on Federal Lands and Minerals would apply to state and private lands and minerals across the anticline crest. With resource protection measures applying to all lands and minerals the expected level of dispersion of surface disturbances and impact to vegetation across the landscape would be much greater under this alternative than potential dispersion under SS and RP alternatives on Federal lands and minerals for either the Project Wide or Anticline Crest scenarios.

The overall acreage affected by short-term and long-term impacts from clearing vegetation under this alternative would be identical to those noted under the SS Alternative and RP Alternative on Federal Lands and Minerals, above. The only anticipated differences between the three alternatives would be levels of disturbances in each vegetation type and the amount of dispersion of that disturbance.

As discussed above under the RP Alternative on Federal Lands and Minerals, no more than 5 drilling rigs would be present, project-wide, and only 2 rigs would be operating north of the New Fork River at any one time. That limitation would apply to all lands and minerals under this alternative which, in turn would limit the amount of vegetation disturbed at any one time. With less exposed bare ground at any given time, widespread infestations of noxious, nonnative weeds would be less likely if areas of older surface disturbances were under various stages of reclamation than if many areas in a locale were exposed at the same time.

Pad Drilling. On areas where no standard stipulations or resource protection measures apply to either avoid wells or limit well pad density, up to 16 well pads/section could be developed at single well pads. But in other areas where resource protection measures limit well pad densities to 2, 4 or 8 pads/section, multiple wells could be drilled from one well pad. With limited well pad densities applied to all lands and minerals, the geographic distribution of disturbance due to pad drilling is expected to be more dispersed than under other alternatives and options. However, estimates of short-term and long-term impact to vegetation would be the same as for the pad drilling option under the RP Alternative on Federal Lands and Minerals.

Centralized Production Facilities. Implementation of centralized production facilities in any of the vegetation types on the project area has the potential to increase short-term impacts but decrease long-

term impacts. By drilling up to 16 well pads/section on lands that would otherwise be subject to limited pad densities, the expected dispersion of surface disturbances to vegetation would be comparable to distributions envisioned under the SS Alternative. But, the long-term disturbance would be decidedly less than on any other alternatives, including the Centralized production facilities option in the RP Alternative on Federal Lands and Minerals because more of the project area would be applicable for implementing this option. As noted under the discussion of this option in the RP Alternative on Federal Lands and Minerals, increased surface disturbances under any scenario and any of the alternatives will increase the risk of weed infestations and reduced revegetation success. With the limitation on the number of drilling rigs that could be present, the amount of soils exposed at any one time would be limited and would reduce the chance for widespread weed establishment.

4.15.3.4 No Action Exploration/Development Scenario. Implementation of the No Action Exploration/Development Scenario would eliminate project-related impacts to vegetation.

4.15.4 Additional Mitigation Opportunities. There are additional mitigation measures which should be implemented to further reduce impacts to vegetation. The BLM can impose the following mitigation measures on Federal lands. Adoption of these measures on private or state lands would be required by other governmental entities or would be strictly voluntary on the part of the operator.

Vegetation Mitigation Opportunity 1. Where reclamation success conflicts with livestock are anticipated, the operators could fence the entire well pad until final restoration is complete. Only the pit is currently fenced at many of the existing well pad locations and livestock can move unhindered across the remainder of the disturbed sites. In addition to revegetation concerns, livestock on these locations are also damaging spill containment berms around tanks and other equipment.

Vegetation Mitigation Opportunity 2. Operators should consider the potential for weed infestations early in project planning. Invasive and non-native species problems would be addressed at annual meetings. To protect against the spread or introduction of non-native or invasive species, some mitigation measures that may be applied include,

coordination with county weed and pest agency, pre-site inspections of gravel sources to assure they are free of non-native and invasive species, rapid revegetation requirements to reduce invasion of non-natives, less ground disturbance, herbicide treatments for non-native and invasive species. Operators should file Pesticide Use Proposals (PUP) with BLM early in the development process rather than wait for weed infestations to occur.

4.15.5 Monitoring Requirements. Inspections of revegetation efforts should be conducted after the second and fourth growing seasons to evaluate success. The need to reseed, fertilize or spot treat should be determined by the operator and the BLM. Successful revegetation should be based on the ability of the vegetation to stabilize reclaimed sites and to provide livestock and wildlife habitat. If reseeding is judged to be necessary, based on vegetation density and composition of adjacent areas, the SWPPP/ERRPs should be reviewed for any necessary changes to improve revegetation success. It is important that the successes and failures of revegetation efforts be included in the annual development review and that input from the public be solicited by BLM to determine what other reclamation techniques may be successful in the project area (see Appendix A).

4.16 Grazing Resources

4.16.1 Scoping Issues. The following issues related to livestock and grazing resources were raised during the scoping process:

1. Address conflicts with livestock and range improvements.
2. Address control of noxious weeds.
3. Address impacts to domestic animal health and safety.
4. Present pit fencing is inadequate to keep livestock out.
5. Entire location should be fenced to keep livestock out and to promote restoration.
6. Aboveground pipelines are barriers to cattle movement - bury all pipelines.
7. If aboveground pipelines are installed, no clearing of the construction area should be allowed.
8. Keep pipelines in a corridor.
9. Fence pipeline risers so cattle don't rub against them.
10. Pipeline construction should be coordinated with livestock trailing activities.

11. Development needs to be evaluated according to BLM's Standards for Healthy Rangelands.
12. Development will decrease land available for grazing and BLM will be forced to reduce AUM numbers in the area in order to make up for loss of grazing land. Loss of AUMs will mean cattle operators will go out of business.
13. Concerned that water used for drilling will reduce water availability for cattle and wildlife - drawdown of stock wells and springs.
14. Pipelines should follow fence lines and existing roads where possible.

4.16.2 Significance Criteria. Impacts produced by the project alternatives are considered significant if:

- animal unit months (AUM) in any single grazing allotment decline by five percent or more through clearing or disturbance of vegetation; or
- project activities result in long-term disruption of grazing management, such as changes in livestock use patterns, which result in increased resource conflicts or changes in ranching operations, livestock trailing, watering, fencing and feeding.

4.16.3 Alternative Impacts.

4.16.3.1 Summary of Impacts Common to All Alternatives (Except the No Action Exploration/Development Scenario). Proposed drilling activities within the PAPA could potentially affect 16 BLM grazing allotments in the project wide area or 11 allotments along the anticline crest. The majority of grazing use on these allotments is by cattle between May and July (Table 3-30). Estimates of impacts on grazing have considered that forage production across rangeland within the affected allotments (based on weighted averages) is about 11.5 acres per AUM. The primary impact to grazing resources within the PAPA would be the loss of forage associated with construction and production-related disturbance. The loss of forage from disturbance would be temporary (short-term), lasting until areas are revegetated, approximately three to five years after reclamation. Potential forage loss estimates provided in the discussion of alternatives are based on Project Wide and Anticline Crest development scenarios because the locations of wells, roads and pipelines are not known and so impacts cannot be predicted for specific allotments. Production-related disturbance, such as portions of well pads and road surfaces,

would convert rangeland to an industrial use for the life of the facility. Other impacts which could occur include: displacement of livestock from preferred grazing areas and stock watering facilities or ponds; disruption of livestock trailing, damage to range improvements; the spread of noxious weeds; and increased injury or loss of livestock from vehicle-livestock collisions or other incidents associated with oil and gas operations. Successful revegetation of disturbed areas with grasses and forbs, would cause a localized increase in the availability of livestock forage over time. Depending upon the intensity of use, grazing could interfere with revegetation of reclaimed areas.

Section 4.13 describes the potential impacts that the drilling of water supply wells in the PAPA could have on the existing stock water wells which draw from shallow aquifers.

As experienced recently by some of the livestock operators in the PAPA, impacts from project development would include increased traffic and traffic speeds which not only are a threat to livestock but also to other resources and resource users in the area (i.e., wildlife, recreational users, residents). Other impacts may include the interference of cattle trailing by surface pipelines (typically greater than six inches in diameter) and new roads that run perpendicular to cattle drive trails, or large surface pipelines laid across two-track roads which impede vehicles and cause annoying and sometimes long detours. Additionally, impacts could occur to the existing range improvements (i.e., fences, cattleguards), and to water wells or impoundments. Further, the proposed development could convert the rangeland landscape of the PAPA into an industrial landscape. This could result in a change in lifestyle for ranchers who have depended on this landscape for generations. The types of production equipment typical with PAPA wells can be damaged by livestock.

Compression. The proposed compressor station locations for Jonah Gas are located in the Mesa Common (Section 3, T. 31 N., R. 10 W.) and the Stud Horse Butte (Section 36, T. 30 N., R. 108 W.) allotments. Western Gas' proposed compressor stations located in Section 4, T. 30 N., R. 108 W. and Section 34, T. 29 N., R. 108 W. would be located in the Blue Rim and Boundary allotments, respectively. Ultra's potential compressor station in Section 16 T. 31 N., R. 108 W. would be located in the Fremont Butte Common Allotment.

All of these potential compressor stations sites are located in the PAPA except for Western Gas' proposed site located in Section 34, T. 29 N., R. 108 W. This station would be located in the Jonah II Field at an existing compressor station. Construction of the proposed 7 acre compressor station sites could potentially remove about 0.6 AUMs from the allotments that the compressors would be located in (based on an average of 11.5 acres per AUM throughout the PAPA). The AUM loss would be long-term. Because all of these sites, except Ultra's, are located on an existing utility corridor, adjacent to existing roads, impacts to livestock operations would be minimal. Ultra's site would result in a reduction of less than 1 AUM.

Sales Pipeline. The sales pipeline would affect seven allotments in the Rock Springs and Kemmerer Field Office Areas including the Figure Four, 18-Mile, Lombard, Seedskaadee, Slate Creek, Cow Hollow and Granger Lease. All of these allotments are grazed by sheep and cattle, except Cow Hollow which is only grazed by cattle. Approximately 23 miles of the route north of the Green River crossing is within the Little Colorado Desert Wild Horse Herd Management Area. This area is a designated management area with an appropriate management level of 69 to 100 horses (BLM, 1998a). Compared to the PAPA, forage production is lower for these allotments and averages about 15 acres per AUM. The impact from lost forage from pipeline construction would be short-term, because all disturbed areas would be reclaimed. In the long-term, after the pipeline right-of-way has been successfully revegetated there should be a localized increase in forage production which would be a positive impact to grazing. Depending upon the intensity of use, grazing could interfere with revegetation of reclaimed areas.

BP Amoco Field Office. The BP Amoco Field Office would be located within the Stud Horse Butte allotment and would disturb 5 acres. This disturbance is equivalent to about 0.8 AUMs based on a forage production rate of 6.32 acres per AUM as indicated in Table 3-30. This forage loss would occur in the short- and long-term and is not considered significant.

4.16.3.2 Project Wide Exploration/Development Scenario

Standard Stipulations Alternative. Tables 4-41 provides estimates of potential annual AUMs lost for a 500 well pad development level over a 10-year

period. During development, areas that are disturbed but are not needed for production would be reclaimed (i.e., portions of well pads, road and pipeline rights-of-way) and would provide forage available to livestock within about three to five years. If a constant rate of development occurred and all 500 potential well pad locations were developed in a 10-year period, an average of 64 AUMs would be lost annually within the project area. Table 4-41 assumes that an average of 598 acres would be reclaimed annually and returned to a productive state within four years after reclamation begins. It is assumed that reclamation would be initiated during the second year of the project and the forage from these reclaimed areas would be available in the fifth year of development. Accounting for the forage produced from these reclaimed areas, it is estimated that the highest net loss of AUMs in the project area would occur in the fifth year of development and is estimated to be about 320 AUMs (see Table 4-41) or approximately 0.9 percent of the total 34,940 AUMs available in the 16 allotments (see Table 3-30). Using the average forage production rate of 11.5 acres per AUM across the total 165,159 acres of allotments in the project area there is estimated to be 14,362 AUMs of forage available in these allotments in the PAPA. The maximum net AUM loss would account for approximately 2.2 percent of the available forage in the project area.

These same calculations can be used to estimate the potential AUMs lost from a 700 well pad development level by using the disturbance estimates provided in Table 2-9 and the assumptions previously discussed. These calculations indicate that the highest net loss of AUMs from 700 well pads would also occur in the fifth year and would be approximately 395 AUMs or about 1.1 percent of the total forage available in the 16 allotments. This maximum net AUM loss would account for approximately 2.8 percent of the available forage in the project area which is considered insignificant on a project wide basis.

RP Alternative on Federal Lands and Minerals.

The pace of development associated with this alternative would be reduced because there would be only 5 rigs working in the project area at one time (compared to eight rigs for the SS Alternative). Therefore, the estimated AUMs potentially affected would be projected over a 15 year development period for both the 500 and 700 well pad development

levels. Limiting development to 5 rigs working in the project area at one time would reduce the average annual disturbance and maximum AUMs lost within the PAPA but extend the duration of these effects to 15 instead of 10 years. For example, based on the 15 year development level the highest net loss of AUMs in the project area would occur in the fifth year of development and is estimated to be about 215 AUMs for the 500 well pad development level and about 263 AUMs for the 700 well pad development level. The character of the rangelands in the PAPA would be impacted less by development from this alternative because in many SRMZs, well pad density would be limited to 4 well pads/section.

Pad Drilling. For the 500 well pad development level, pad drilling would reduce short-term disturbance in the project area by about 1,098 acres and long-term disturbance by 384 acres compared to the SS Alternative (see Tables 2-10 and 2-12). This reduction in disturbance is associated with fewer well pads, roads and pipelines in the project area. Table 4-42 provides estimates of potential annual AUMs lost over a 15-year development period. If a constant rate of development occurred and all 500 potential well pad locations were developed in a 15-year period, an average of 36 AUMs would be lost annually within the project area. During development, areas that are disturbed but are not needed for production would be reclaimed (i.e., portions of well pads, road and pipeline rights-of-way) and would provide forage available to livestock within about three to five years. The table assumes that an average of 351 acres would be reclaimed annually and returned to a productive state four years after reclamation begins. Reclamation would be initiated after the first year of development.

Accounting for the forage produced from these reclaimed areas, it is estimated that the highest net loss of AUMs in the project area would occur in the fifth year of development and is estimated to be about 180 AUMs (see Table 4-42) or approximately 0.5 percent of the total forage available in the 16 allotments. Based on the 14,362 AUMs available in the PAPA, the maximum net AUM loss would account for approximately 1.3 percent of the available project area forage. Because forage production is estimated to be higher on the reclaimed areas than on the native rangelands, over time as these reclaimed areas come into production the project could have a net positive benefit on AUM production. As is shown on Table

Table 4-41
Estimate of AUMs Potentially Affected in the PAPA from the Standard Stipulations 500 Well Pad Development Scenario Over a 10-Year Development Period (1)

Year	Acres Disturbed (2)	Acres/AUM (3)	AUMs Lost	Acres Reclaimed (4)	Reclaimed Acres/AUM (5)	AUMs Reclaimed (6)	Net AUMs Affected
1	736	11.5	64	0	0	0	-64
2	736	11.5	64	598	6	0	-128
3	736	11.5	64	598	6	0	-192
4	736	11.5	64	598	6	0	-256
5	736	11.5	64	598	6	0	-320
6	736	11.5	64	598	6	100	-284
7	736	11.5	64	598	6	100	-248
8	736	11.5	64	598	6	100	-212
9	736	11.5	64	598	6	100	-176
10	736	11.5	64	598	6	100	-140

1 = Assumes that all development occurs within the 16 grazing allotments in the PAPA.

2 = Annual disturbance is estimated at 736 acres.

3 = Based on the weighted average production (acres/AUM) from all of the allotments in the PAPA.

4 = Reclaimed acres are based on the difference between short- and long-term acres disturbance estimates provided in Table 2-10.

5 = Reclaimed areas produce at a rate of 6 acres/AUM (BLM, 1997c).

6 = AUMs produced from reclaimed areas brought back into production. Reclaimed areas produce forage four years after reclamation based on successful revegetation within three to five years. Assumes all forage is available for livestock use.

Table 4-42
Estimate of AUMs Potentially Affected in the PAPA from the 500 Well Pad RP Alternatives with Pad Drilling Over a 15-Year Development Period (1)

Year	Acres Disturbed (2)	Acres/AUM (3)	AUMs Lost	Acres Reclaimed (4)	Reclaimed Acres/AUM (5)	AUMs Reclaimed (6)	Net AUMs Affected
1	418	11.5	36	0	0	0	-36
2	418	11.5	36	351	6	0	-72
3	418	11.5	36	351	6	0	-108
4	418	11.5	36	351	6	0	-144
5	418	11.5	36	351	6	0	-180
6	418	11.5	36	351	6	59	-157
7	418	11.5	36	351	6	59	-134
8	418	11.5	36	351	6	59	-111
9	418	11.5	36	351	6	59	-88
10	418	11.5	36	351	6	59	-65
11	418	11.5	36	351	6	59	-42
12	418	11.5	36	351	6	59	-19
13	418	11.5	36	351	6	59	4
14	418	11.5	36	351	6	59	27
15	418	11.5	36	351	6	59	50

1 = Assumes that all development occurs within the 16 grazing allotments in the PAPA.

2 = Annual disturbance is estimated at 418 acres.

3 = Based on the weighted average production (acres/AUM) from all of the allotments in the PAPA.

4 = Reclaimed acres are based on the difference between short- and long-term acres disturbance estimates provided in Table 2-12.

5 = Reclaimed areas produce at a rate of 6 acres/AUM (BLM, 1997c).

6 = AUMs produced from reclaimed areas brought back into production. Reclaimed areas produce forage four years after reclamation based on successful revegetation within three to five years. Assumes all forage is available for livestock use.

4-42, positive forage production is first realized 13 years after initial development with a net increase in approximately 50 AUMs in the project area at the end of the 15 year projection period.

Compared to the SS Alternative, pad drilling for the 700 well development level would reduce short-term and long-term disturbance by 1,627 acres and 574 acres, respectively (compare Tables 2-10 and 2-12). Using the same calculations and assumption indicated in Table 4-42 potential AUMs lost from a 700 well development level using pad drilling would have the highest net loss of 215 AUMs in the fifth year of development. This AUM loss is estimated to be approximately 0.6 percent of the total AUMs available in the 16 allotments and about 1.5 percent of the project area forage. The reduction in well pads, roads and pipelines associated with pad drilling would also minimize interference with grazing operations.

Centralized Production Facilities. Although the use of CPF would cause a small increase in short-term disturbance, long-term disturbance would be decreased in the project area compared to RP Alternative. These disturbance differences would only have a minor affect on forage availability between these development scenarios. In the short-term, during the 15 year development period, traffic-related impacts to grazing operations would be the same as the RP or SS alternative because the same number of wells would be drilled for either the 500 or 700 well development level. The use of centralized production facilities would eliminate production facilities in some SRMZs and would decrease traffic levels and human presence in the PAPA in the long-term. These factors should reduced interferences with livestock operations. Further, the character of the landscape would have less of an industrial setting because well pads would be much less visible.

Resource Protection Alternative on All Lands and Minerals. This alternative would have the same potential forage reduction impacts as those described for the RP Alternative on Federal Lands and Minerals including those impacts addressed for pad drilling and centralized production facilities. This alternative would apply mitigation measures that would reduce or avoid development in some SRMZs in the project area. Reducing development in these areas would minimize the change of the rangeland landscape to an industrial landscape.

4.16.3.3 Anticline Crest Exploration/ Development Scenario

Standard Stipulations Alternative. Impacts from anticline development would be restricted to an area which is approximately one-third the size of the PAPA. Although, this development scenario would increase impacts to the anticline crest area, impacts to other areas of the PAPA are not anticipated or would be much smaller. Development impacts outside the anticline crest area would be from isolated development (hot spots) or from ancillary project components such as a roads or pipelines. This development scenario would have the same forage loss as described for the Project Wide Scenario for both the 500 and 700 well pad development levels. However, impacts would principally occur to the 11 allotments, listed on Table 4-43, that are within the anticline crest area. Based on the potential loss of 320 AUMs for the 500 well development level this forage reduction would be about 6.1 percent of the total 5,215 AUMs available in the anticline crest area. The total AUMs available in the anticline crest is based on an average forage production rate of 11.5 acres per AUM on all rangelands within the 11 allotments (59,969 acre) in the anticline crest area.

Allotment Name	Acres
Blue Rim Individual (2173)	15,222
Boundary/Poston (13005)	4,851
Burch Ind. (2050)	40
Clark/Bloom Common (2053)	2,373
Fremont Butte Common	122
Mesa Common (2031)	14,519
Mount Airy Common (2049)	7,969
N.W. Square Top (2123)	2,979
New Fork Individual (2113)	2,366
Square Top Common (2051)	1,786
Stud Horse Butte (2008)	7,741
Total	59,968

The potential forage lost from the 700 well development level is estimated to be about 7.6 percent of the total anticline crest forage. This is based on a potential maximum forage loss of 395 AUMs in the anticline area. The potential forage lost within each allotment cannot be predicted since the locations of well pads, roads and pipelines are

presently not known. However, this amount of forage loss is considered significant in the short-term throughout the anticline crest area for both development scenarios. In the long-term as reclaimed areas are successfully revegetated the forage lost from development would be compensated for because forage production from reclaimed areas is estimated to be higher than on native rangelands.

If, according to Section 2.2.2, a portion (30 percent) of the anticline development occurs away from the anticline crest the forage loss impacts would be reduced. For example, if the estimated AUM loss for the 500 well development level was reduced by 30 percent from 320 AUMs to 224 AUMs, this amount of forage loss would be less than 5 percent of the total available forage within the anticline area and below the 5 percent significance criteria. However, for the 700 well development level reducing the amount of forage loss by 30 percent within the anticline crest area would still be considered significant because it would result in an estimated 5.3 percent forage loss in the anticline crest area.

Resource Protection Alternative on Federal Lands and Minerals. Compared to the SS Alternative and anticline development, annual disturbance and potential AUM loss would be minimized by this alternative because disturbance and forage lost would be projected over a 15 year development period. Therefore, based on the maximum 215 AUMs that could be lost within the anticline crest area for the 500 well development level, this AUM reduction is estimated to be 4.1 percent of the total forage available within the anticline area. The 700 Well Pad RP Alternative would have a maximum potential forage loss of about 263 AUMs which is estimated to be 5.0 percent of the total anticline crest forage. Although, the AUM loss for the 500 well development level is not considered significant, the 5 percent loss in AUMs for the 700 well development level could be. However, as indicated for the SS Alternative, if 30 percent of the project development occurred outside the anticline crest area in hot spots, the estimated forage loss for the 700 well development level would not be significant because it would be below the 5 percent significance criteria.

Pad Drilling. Compared to the RP alternative, potential forage loss in the anticline crest area would be reduced by pad drilling because of decreased disturbance. This development scenario would have the same amount of potential forage loss as indicated

for the Project Wide RP Alternative with pad drilling for both the 500 (i.e., 180 AUMs) and 700 (i.e., 215 AUMs) well development levels. Based on these forage loss estimates the 500 well development level would account to about 3.5 percent of the total anticline crest forage (5,215 AUMs). While the forage lost from the 700 well development level is estimated to be about 4.1 percent of the AUMs in the anticline crest area.

Centralized Production Facilities. The impacts of centralized production facilities would be the same as those discussed for the Project Wide RP Alternative.

Resource Protection Alternative on All Lands and Minerals. This alternative would have the same potential forage reduction impacts as those described for the RP Alternative on Federal Lands and Minerals including those impacts addressed for pad drilling and central production facilities option. This alternative would apply mitigation measures that would reduce or avoid development in some SRMZs in the project area. Reducing development in these areas would minimize the change of the rangeland landscape to an industrial landscape.

4.16.3.4 No Action Exploration/Development Scenario. Under this scenario, project development and potential impacts would not occur to grazing resources.

4.16.4 Additional Mitigation Opportunities. There are additional mitigation measures which should be implemented to further reduce impacts to grazing use. The BLM can impose measures 2 through 4 on Federal lands. Measure 1 would be strictly voluntary on the part of the operator. Adoption of these measures on private or state lands would be required by other governmental entities or would be strictly voluntary on the part of the operator.

Grazing Mitigation Opportunity 1. The operators and the livestock industry should consider developing a Mesa Users Group to address the conflicts that are anticipated to occur between oil and gas development and traditional livestock use in the project area. Agreements should be developed to insure that damage to fences, cattleguards or other range improvements are repaired in a timely manner. Furthermore, the group should prepare agreements that address compensation for livestock losses caused by vehicle collisions, pit or pipeline trench accidents, etc.

Grazing Mitigation Opportunity 2. The transportation planning process for the PAPA should involve the livestock operators so that potential transportation issues identified during public scoping can be resolved. For example, construction and drilling activities could be avoided in livestock trailing corridors during primary trailing periods (typically mid-June through early July).

Grazing Mitigation Opportunity 3. Well pads on all lands should be fenced to insure that livestock do not have access to pits or trample spill containment berms or damage production equipment. Gates should be installed at well locations if cattle guards are installed so that cattle can be easily removed. Fencing specifications should also exclude wildlife from well pads. Fences should be installed around reclaimed areas at well pad locations where necessary to insure successful revegetation.

Grazing Mitigation Opportunity 4. If development in any allotment becomes extensive and more than 5 percent of the AUMs are lost in that portion of the allotment within the project area, the operators should consider reimbursing the allotment lessee for the lost AUMs. Such reimbursement should continue until reclamation replaces the lost AUMs.

4.16.5 Monitoring Recommendations. The BLM and operators should establish a monitoring program to insure that development and reclamation within the grazing allotments or watersheds in the PAPA meet the Standards for Healthy Rangelands (BLM, 1997c). This monitoring program should address the following: 1) watersheds are functioning properly; 2) water, nutrients and energy are cycling properly; 3) water quality meets State of Wyoming standards; and, 4) habitat for special status species is protected⁵. This monitoring program would review project development and disturbance within each of the allotments in the project area on an annual basis and calculate actual AUM losses or gains by allotment. BLM may need to consider making adjustments (where necessary) so that over-grazing does not occur.

4.17 Wetland and Riparian Resources

4.17.1 Scoping Issues. The following issues related to wetland and riparian resources were raised during scoping.

1. Baseline inventory of wetlands and waterways including ground truthing of National Wetland Inventory maps.
2. Most of the wetlands occur on private lands - how will wetland impacts on private and state lands be handled?
3. Wetlands should be described in terms of their functions and values.
4. Acreage of wetland impacts, by type, should be disclosed.
5. Compensation should be developed for all unavoidable wetland and riparian impacts.
6. No development should occur in riparian areas, wetlands, lakes and springs.

4.17.2 Significance Criteria. In February 1990, the COE and EPA entered into a memorandum of understanding in which the COE agreed to exercise its authority to review Section 404 permit applications nationwide so as to minimize loss of wetlands through appropriate mitigation requirements. Section 404 requires that a permit be issued to insure that no discharge of dredged material or fill material is permitted to enter waters of the U.S. if a practicable alternative exists that is less damaging to the aquatic environment or if the nation's waters would be significantly degraded. To obtain a Section 404 permit, the applicant must demonstrate that three steps have been accomplished: wetland impacts have been avoided, where practicable; potential impacts to wetlands have been minimized; and, compensation has been provided for any remaining unavoidable impacts through activities to restore or create wetlands.

For purposes of this EIS, it was determined that impacts produced by the project alternatives would be significant if:

- there is a loss of wetlands or wetland function in the project area; or
- there is any violation of the requirements listed above for Section 404 permits.

As discussed below, significant impacts to wetlands are likely to occur from implementation of the alternatives. Some of this loss could occur from authorization under general permits without mitigation as a requirement. However, the COE usually requires restoration or creation of similar wetland types (in-kind) as mitigation for projects that impact more than 0.33 acre of wetland. Experience has shown that it takes several years for a wetland created as mitigation to develop functions that are typical of

⁵ See 43 CFR 4180.1.

natural wetlands, especially scrub-shrub and forested wetlands. Therefore, the loss of wetlands without mitigation would be significant long-term impacts and when mitigation is required, there would be significant short-term impacts due to the temporary loss of important wetland functions.

4.17.3 Alternative Impacts

4.17.3.1 Summary of Impacts Common to All Alternatives (Except the No Action Exploration/Development Scenario). Wetlands in the PAPA are primarily associated with the Green River and New Fork River flood plains. These waters are bordered by four of the five wetland types discussed in Chapter 3 and shown on Figure 3-17 (i.e., wet meadow, aquatic bed, riparian scrub shrub and riverine). The fifth wetland type is stock ponds which are scattered throughout the PAPA. Of the approximately 11,258 acres of wetlands that occur in the PAPA, 96 percent occur on private and state lands and minerals. A significant amount of these wetlands (23.7 percent) are in the riparian scrub shrub wetland cover type which are considered to be extremely important (Johnson, 1998).

BLM would avoid locating well pads within 500 feet of perennial streams, riparian areas or wetlands on Federal lands and minerals. In addition, BLM would avoid placement of any well pads within 100-year flood plains. These actions would eliminate any potential direct impacts to wetlands and flood plains from development of well pad locations on Federal lands and minerals. However, some impacts to intermittent streams by road and pipeline crossings would be unavoidable. There are over 1,700 miles of intermittent streams within the PAPA. As long as the COE permit conditions are followed for road and pipeline, construction activities are not expected to cause significant impacts to these "waters of the U.S."

Under all of the development scenarios and alternatives the 500 and 700 well development levels could potentially impact wetlands in the same way, such as by a direct loss of wetlands from filling activities or loss or deterioration of wetland functions. However, the probability for these impacts to occur would be greater with the 700 well pad development level because of the additional 200 wells and associated roads and pipelines.

Compression. None of the compressor station sites are located in wetlands or flood plains with the

exception of Jonah Gas' proposed compressor station on state lands in Section 36, T. 30 N., R. 108 W. This site is located within the 100-year flood plain of an intermittent drainage that is also designated as a wetland (See Figures 3-17 and 3-18). Significant impacts to ephemeral streams are not anticipated provided roads and pipelines are constructed in accordance with COE permit conditions.

Sales Pipeline. The sales pipeline would cross the Green River and Blacks Fork and their associated wetlands. The wetland types at these crossings which could be impacted include palustrine emergent, scrub shrub, unconsolidated shore and riverine lower perennial. Cottonwoods and willows are present at the Green River crossing while willow and hawthorn are present at the Black Forks crossing. The impacts to these rivers and wetlands would depend on the crossing technique (open-cut or boring).

BP Amoco Field Office. BP Amoco's field office would be located on Federal lands and sited to avoid any wetlands, therefore, construction of the field office would not impact wetlands.

4.17.3.2 Project Wide Exploration/Development Scenario.

Standard Stipulations Alternative. This alternative would protect approximately 779 acres of the 11,258 acres of wetlands (about 7 percent) in the project area from disturbance by 19 potential well pads. This protection would only apply to Federal lands and minerals and, because of their location, the wetlands protected are likely to have lower functions than those which could be impacted on non-Federal lands and minerals. There are 259 potential well pad locations that could be developed in wetlands on private and state lands and minerals under this alternative. Construction-related disturbance within these wetlands would still require a permit under Section 404 of the Clean Water Act. Although the COE would require mitigation for most wetland impacts, this alternative would result in significant long-term impacts due to a loss of wetlands and short-term impacts due to a temporary loss of wetland functions on non-Federal lands with non-Federal minerals.

This alternative also includes the possibility that up to 341 potential well pad locations could be developed in the 100-year Flood Plain SRMZ on non-Federal lands and minerals in the project area. The

Flood Plain SRMZ includes the 100-year flood plain plus a 500 foot buffer (See Figure 3-18). Sublette County has developed specific regulations that address development within 100-year flood plains. The county defined flood plains are the same as those shown in Figure 3-18. Specifically, the county prohibits construction of any structure in a floodway which it defines as *"that area of the county, including the channel of any water course, stream, or river, required to effectively carry and discharge floodwaters, that is inundated by the ten year recurrence interval flood."*⁶ The county regulations would require the operators to design "proposed structures" in the flood plain to at least the requirements of the U.S. Department of Housing and Urban Development for Federal flood insurance eligibility. The regulations also require that all site improvements be designed and constructed to minimize ground water pollution or contamination in areas where the water level is within four feet of the ground surface. It is believed that the original intent of this requirement would mean that the operators would be required to use closed drilling systems within the flood plains.

RP Alternative on Federal Lands and Minerals.

This alternative would apply restrictions, the goal of which would prevent uncontrolled runoff from leaving well pads within 1,000 feet of streams, wetlands and riparian areas on Federal lands and Minerals. This goal would help prevent deterioration of wetland functions from contamination from well pads. However, this alternative would result in the same impacts to wetlands and 100-year flood plains on non-Federal lands and minerals as described above for the SS Alternative because the majority of the impacts to wetlands would occur on non-Federal lands and minerals. As such, this alternative could result in significant impacts to wetlands.

Pad Drilling. Pad drilling would minimize disturbance by reducing the total number of well pads and associated road and pipeline densities which would also potentially minimize wetland impacts on Federal lands and minerals. However, since 96 percent of the wetlands that occur in the project area occur on private lands where this mitigation measure would not be applied, pad drilling would have little affect on reducing the impacts to wetlands.

Centralized Production Facilities. These facilities would not reduce potential impacts to wetlands

because these facilities would not decrease the amount of disturbances from well pads, roads or pipelines in the project area. In addition, this option would not be utilized by the operators on private or state lands where 96 percent of the wetlands occur.

RP Alternative on All Lands and Minerals.

Under this development scenario, this alternative would provide the highest level of protection to wetlands and flood plains by avoiding well pad locations within 500 feet of wetlands throughout the project area including private and state lands and minerals. Well pad avoidance would apply to the pad drilling and Centralized production facilities options. To maintain a 500 foot buffer around wetlands, this alternative would result in relocation or elimination of 503 potential well pad locations on state and private lands. Furthermore, this alternative would not allow well pads within the 100-year flood plain on all lands and minerals. If this alternative is applied it would result in the relocation or elimination of 232 potential well pad locations. This alternative would not result in significant impacts to wetlands or flood plains. However, implementation of this alternative may result in a minerals takings. Because large areas within the flood plains of the New Fork and Green rivers would not be allowed to be developed, adjacent directional wells may not fully drain the gas resource in these areas.

4.17.3.3 Anticline Crest Exploration/ Development Scenario. Under this development scenario there would be a much smaller area of wetlands that could potentially be impact by development. For example, compared to the 11,258 acres of wetlands that occur in the project wide area only about 1,427 acres of wetlands occur in the anticline crest area (about 13 percent).

Standard Stipulations Alternative. This alternative would protect approximately 290 acres of the total 1,427 acres of wetlands (about 20 percent) that occur in the anticline crest area from disturbance by well pads. This protection would only apply to Federal lands and minerals. The wetlands protected are likely to have lower functions than those which could be impacted on non-Federal lands and minerals because a large percentage of these wetlands are associated with stock ponds. There are 25 potential well pad locations that could be developed in wetlands on private and state lands and minerals under this alternative in the anticline crest area. As with the project wide development scenario,

⁶ See Sublette County Zoning and Development Regulations Resolutions, June 18, 1996.

construction-related disturbance within these wetlands would still require a permit under Section 404 of the Clean Water Act. Although the COE would require mitigation for most wetland impacts, this alternative would result in significant long-term impacts due to a loss of wetlands and short-term impacts due to a temporary loss of wetland functions on non-Federal lands with non-Federal minerals.

This alternative also includes the possibility that up to 46 potential well pad locations could be developed in the 100-year Flood Plain SRMZ on non-Federal lands and minerals in the anticline area. Sublette County has developed specific regulations that address development within 100-year flood plains which are explained for this alternative under the Project Wide Scenario.

RP Alternative on Federal Lands and Minerals.

This alternative would result in the same impacts to wetlands and 100-year flood plains on non-Federal lands and minerals as described above for the SS Alternative because the majority of the impacts to wetlands would occur on non-Federal lands and minerals. As such, this alternative could result in significant impacts to wetlands. This RP Alternative would apply a goal that would prevent uncontrolled runoff from leaving well pads within 1,000 feet of streams, wetlands and riparian areas on Federal lands and minerals. This goal would help prevent deterioration of wetland functions due to contamination from well pads.

RP Alternative on All Lands and Minerals.

Compared to all of the development scenarios and alternatives, this RP Alternative would provide the highest level of protection to wetlands and flood plains by avoiding well pad locations within 500 feet of wetlands throughout the anticline. To maintain a 500 foot buffer around wetlands, this alternative would result in relocation or elimination of 64 potential well pad locations on state and private lands. Moreover, this alternative would not allow well pads within the 100-year flood plain on all lands and minerals. If this alternative is applied it would result in the relocation or elimination of 32 potential well pad locations. This alternative would not result in significant impacts to wetlands or flood plains.

4.17.3.4 No Action Exploration/Development Scenario. This scenario would eliminate any potential oil and gas development impacts to wetlands, waters of the U.S. or flood plains.

4.17.4 Additional Mitigation Opportunities.

There are additional mitigation measures which should be implemented to further reduce impacts to wetlands and flood plains. The BLM can impose measures 1 and 3 on Federal lands. Adoption of all other measures, which involve primarily private or state lands, would be required by other governmental entities or would be strictly voluntary on the part of the operator.

Wetland Mitigation Opportunity 1. If unavoidable, construction in wetlands or areas with high water tables should be delayed until the dry period.

Wetland Mitigation Opportunity 2. The Federal Energy Regulatory Commission (FERC) has developed a number of standard procedures for construction in wetlands and streams (FERC Procedures). Although FERC has no regulatory authority pursuant to the activities of the operators, the FERC Procedures provide excellent guidance that would significantly minimize potential construction-related impacts on non-Federal lands and minerals. The operators and Sublette County should review these procedures and adopt applicable portions⁷.

Wetland Mitigation Opportunity 3. Because a spill could result in a significant, wide-spread impact to wetlands and adjacent drainages (perennial, intermittent or ephemeral), the operators should consider installing product storage tanks in upland areas off well pads located in wetlands. Wetland spill response and clean up should be addressed in SPCC plans.

Wetland Mitigation Opportunity 4. The COE should assure that everything "practicable" has been done to avoid impacts to wetlands, including options to route roads and pipelines away from wetlands and flood plains. Operators should provide complete economic assessments for every well pad proposed in a wetland that demonstrates why the desired bottomhole cannot be reached from an upland surface location. Only where denial of an individual permit would result in a taking of the mineral lease should the COE allow a well pad to be placed in a wetland. Pad drilling should be considered by the COE as a viable alternative to reducing wetland impacts. The BLM's Reservoir Management Group should assist the COE in evaluating the economic

⁷ A copy of FERC's Wetland and Waterbody Construction and Mitigation Procedures can be found at <http://www.ferc.fed.us/gas/environment/gidlines.htm>

feasibility of development from sites outside of wetlands and pad drilling. The COE should begin development of a comprehensive compensatory mitigation program to replace wetlands lost to project development. That program, to the extent possible, should replace wetlands in the immediate vicinity of the area of impact. Where possible, the replacement should occur in the drainage sub-basin where the impact occurred. In no case should replacement occur outside the New Fork River or Green River drainage basins. The COE should carefully coordinate and monitor impacts on non-Federal lands and minerals so that replacement of lost function and value is adequate and timely. The operators should start identifying possible sites for wetland creation in the project area.

Flood Plain Mitigation Opportunity 1. It is uncertain whether county zoning and development regulations would require closed mud systems for rigs operating within 100-year flood plains. The county should clarify this requirement as it applies to oil and gas development within flood plains. This clarification should include a review of the appropriateness of any sort of pit within the flood plains and the need for the operators to address contamination of shallow groundwater through SPCC planning.

Flood Plain Mitigation Opportunity 2. Because of flood hazards and the potential for tanks to be damaged and their contents released during flooding, the operators should consider relocating all tanks outside the 100-year Flood Plain SRMZ. This may require the use of centralized production facilities which would also aid in reducing visual resource impacts, particularly adjacent to the New Fork River near U.S. Highway 191.

4.17.5 Monitoring Recommendations. The COE should participate in the annual development review and provide the other agencies, operators and public with estimates of wetlands lost due to development and status of replacement efforts.

4.18 Threatened and Endangered Species and Special Status Species

4.18.1 Scoping Issues

1. Address impacts to Colorado River endangered fishes from surface water withdrawals.
2. Address impacts to state Priority One birds and mammals.

3. Searches for black-footed ferrets should be conducted in prairie dog towns in excess of 200 acres.
4. Surveys should be conducted for bald eagle roosts and nest sites.
5. Consider potential impacts to Canada lynx, swift fox and mountain plover.
6. If potential suitable habitat for mountain plovers is present, surveys should be conducted.
7. Surveys for nesting raptors and roost sites should be completed.
8. Evaluate habitat loss and degradation, nest abandonment and electrocution/collision hazards to raptors.
9. The project should not take USFWS wildlife trust resources.
10. Protect raptors from target-practice activities.
11. Preclude development within a half mile of all raptor nests.
12. Preclude development within 1 mile of all raptor nests.

4.18.2 Significance Criteria. Impacts to Federally listed threatened and endangered species, species proposed for listing, candidate species, and species with special status recognized by USFWS, BLM and WGFD would be considered significant if any of the following occurs:

- the death of any individuals due to project-related activities which would jeopardize the continued existence of a species;
- reduced recruitment and/or survival of individuals that would impede species' recovery;
- loss of Federally designated critical habitats; or
- contributing causes to warrant an unlisted species to be proposed for listing as threatened or endangered under the Endangered Species Act.

4.18.3 Alternative Impacts. Section 7(a) of the Endangered Species Act (ESA) requires BLM to insure that actions which they authorize or permit are not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat for such species. In their mitigation policy, WGFD (1998) identified all Federally listed species and their delineated critical habitats as "irreplaceable": any impact would be excluded to avoid any loss of habitat (Table 4-44). The only designated critical habitat potentially affected would be in the Colorado River system, downstream from the project area where 4 endangered fish species occur: water depletions from the Colorado River system could jeopardize those

species and their critical habitat. As discussed below, implementation of any alternative is not expected to reduce the reproduction, number or distribution of a Federally listed species to such an extent that would appreciably reduce the likelihood of the survival and recovery of that species in the wild (50 CFR 420.02).

Candidate species do not receive protection under ESA unless they are the subject of a published proposed rule determining endangered or threatened status. However, USFWS monitors the status of all candidates, especially those for which available information indicates an imminent threat and USFWS encourages consideration of these during long-range environmental planning⁸. BLM policy does not allow actions that would change the status of candidate species under the ESA. In addition, the WGFD (1998) Mitigation Policy recommends no loss of habitat function for any Federal candidate species (see Table 4-44).

The *Biological Assessment* incorporated into this EIS is used to review actions and programs authorized, funded, or carried out by the BLM and the cooperating agencies to determine potential effects on threatened and endangered species and species proposed for listing by USFWS. BLM policy requires that all adverse impacts on threatened and endangered species and their habitats be avoided except when: 1) it is possible to compensate adverse effects totally through alternatives identified in a biological opinion rendered by USFWS; 2) an exemption has been granted under the ESA; or 3) the USFWS biological opinion recognizes an incidental taking. Adverse impacts on species proposed for listing are to be avoided while their Federal status is being determined. Mitigation measures provided will insure compliance and reduce potential impacts to insignificant levels.

4.18.3.1 Summary of Impacts Common to All Alternatives (Except the No Action Exploration/Development Scenario). Impacts on Federally listed endangered or threatened species were considered and evaluated if a species potentially occurs in the vicinity of the PAPA or if any of the criteria listed below are met:

- direct mortality of individuals (fish, wildlife, or plants);
- long-term or permanent loss or alteration of existing or potential fish or wildlife habitat

supporting significant life history functions (e.g., breeding, wintering or migration); or

- temporary alteration or disturbance of habitat that may result in avoidance by listed fish or wildlife species and increased mortality or lowered reproductive success.

Impacts common to all alternatives, as discussed in Section 4.19, also apply to listed endangered and threatened fish and wildlife and other sensitive species (see Table 4-45). Because the distribution and abundance of threatened and endangered species are limited or are in decline, any impact could have a greater effect on the size or viability of these populations than on populations of non-endangered or non-threatened species. Habitat availability is often a limiting factor for endangered and threatened species and the short- or long-term loss of suitable habitat can contribute to the decline of populations. Further, direct short-term impacts such as mortality and displacement can be much more devastating than with other, more common species because displacement from suitable to less-suitable habitats in surrounding areas may decrease reproductive success and individual survival. Mortality of a single individual would be a highly significant loss to the species and most certainly to the local population.

Black-footed Ferret. It is extremely unlikely that a black-footed ferret would be found in the PAPA. Therefore, there is an extremely remote possibility that black-footed ferrets could be killed by vehicles. Except for a 1979 record judged as confirmed (USFWS, 1991) found in the PAPA and two records judged as positive (1930 and 1965) in the vicinity of Farson (Clark, 1978) there is no recent documented evidence that ferrets presently occur within the PAPA. Approximately 5,803 acres of prairie dog colonies have been mapped within the PAPA and there are possibly colonies that have not been identified. Colonies that have been previously documented have probably changed in terms of extent and occupancy by prairie dogs since they were first delineated. Wyoming BLM has adopted standard guidelines to mitigate any possible impact to black-footed ferrets and other Federally listed species (BLM, 1992):

"Prior to conducting any onsite activities, the lessee/permittee will be required to conduct inventories or studies in accordance with BLM and U.S. Fish and Wildlife Service guidelines

⁸Federal Register. November 15, 1994. 59(219):58982-59028.

Table 4-44

Summary of Wyoming Game and Fish Commission Mitigation Policy as it Applies to Wildlife Species and Wildlife Habitats

Mitigation Category	Recommended Mitigation Objective	Applicable Species and/or Habitats
Irreplaceable Species/Habitats	No loss of habitat or habitat function: the impact is excluded	<ul style="list-style-type: none"> • Federally Listed Threatened and Endangered Species • Federally Delineated Critical Habitat
Vital Species/Habitats	No loss of habitat function (arrangement and capability of habitat components to sustain species, populations, and wildlife diversity over time); species supported by the habitat are unchanged.	<ul style="list-style-type: none"> • Federal Candidate Species • Wyoming Native Species of Special Concern Status 1 & 2 • Wyoming Crucial Habitats • Wetlands • Stream Class 1 (premium trout waters, fishery of national importance)
High Species/Habitats	No net loss of habitat function for biological community encompassing project area. The area will support species' populations by maintaining habitat function	<ul style="list-style-type: none"> • Wyoming Native Species of Special Concern Status 3 • Trophy Game Animal • Big Game, Trophy Game Winter-Yearlong Range • Parturition Areas • Riparian Habitats • Other Important or Limited Habitat (aspen, old growth, snags, cliffs, caves) • Stream Class 2 (very good trout waters, fishery of statewide importance) • Trophy Fisheries (managed for angling larger than average fish) • Species Fisheries (managed for angling unique fish species)
Moderate Species/Habitats	No net loss of habitat value (relative importance of habitat type and conditions to sustain socially or ecologically significant wildlife populations)	<ul style="list-style-type: none"> • Game Fish • Furbearing Animal • Wyoming Native Species Status 4 • Big Game Animal • Game Birds • Other Big Game and Trophy Game Seasonal Ranges • Stream Class 3 (important trout waters, fishery of regional importance) • Wild Fisheries (managed for angling non-stocked, natural reproducing fishery) • Basic Yield Fisheries (managed for angling opportunities, stocked or not)
Low Species/Habitats	Minimize reduction of habitat value (habitat is abundant or not essential to sustain a community, population, or subpopulation).	<ul style="list-style-type: none"> • Native Species Status 5-7 • Small Game • Stream Class 4 (low production trout waters, no sustained fishing pressure) • Stream Class 5 (very low production waters, often without trout fishery) • Put-and-Take Fisheries (angling for hatchery-raised fish)

to verify the presence or absence of this species. In the event that (black-footed ferret) occurrence is identified, the lessee/permittee will be required to modify operational plans to include the protection requirements of this species and its habitat (e.g., seasonal use restrictions, occupancy limitations, facility design modifications)."

Across their range, black-footed ferrets have been impacted by habitat loss, specifically by vast reductions of prairie dog colonies. The distribution of these colonial rodents has diminished as land has been converted to agriculture and by urbanization (Knowles, 1995; Wuerthner, 1997). Indiscriminate shooting (Vosburgh and Irby, 1998) and intentional poisoning (Roemer and Forrest, 1996) have impacted colonies on a local scale. Recreational shooting can reduce local prairie dog populations by 35 to 69 percent (Knowles, 1988; Vosburgh and Irby, 1998). Exotic disease epizootic episodes (sylvatic plague)

have eliminated prairie dogs from larger areas (Mulhern and Knowles, 1995).

Typically, prairie dog populations can recover from shooting in one year (B. Perry, USFS, Wall Ranger District, Wall, South Dakota, personal communication with PIC Technologies, Inc.) while recovery following cessation of poisoning can take one to two years (Knowles, 1986; Cincotta *et al.*, 1987; Apa *et al.*, 1990). Recovery of populations following plague, however, occurs much slower and some populations may never recover to pre-epizootic levels (Mulhern and Knowles, 1995). Sylvatic plague is fatal to black-footed ferrets (Williams *et al.*, 1994).

Prior to any surface disturbing activities, BLM would require project proponents to examine sites for prairie dog colonies and evaluate them for their potential as habitat for black-footed ferrets (Appendix A) and, if appropriate, conduct surveys for

Table 4-45
Summary of Primary and Secondary Impacts to Wildlife Expected in the Project Area for All Alternatives Except the No Action Exploration/Development Scenario

Impact Type	Species-Group-Habitat	Documented or Inferred Effects	Circumstances - Location	Sources
Primary Impacts				
wildlife-vehicle collisions	mule deer	mortality increases with traffic volume and winter severity; construction of new highways through deer travel lanes leads to substantial mortality	migration, winter range in SW Wyoming; NE Utah	Reeve, 1990; Romin & Bissonette, 1996
		summary of deer mortality on highways; collisions increase with traffic and vehicle speed	highways nation-wide; western US	Arnold, 1978; Reed, 1981; Reeve, 1986
	wildlife in habitats adjacent to roads	mortality of nocturnal, slow moving mammals, birds found in right-of-way vegetation, reptiles and amphibians in habitats adjacent to highways	highways nation-wide; Texas	Leedy, 1978; Case, 1978; Wilkins & Schmidly, 1980; Adams & Geis, 1984
wildlife mortality during construction	burrowing animals and wildlife using burrows	inferred from studies showing numerous vertebrate species use burrows made by burrowing mammals; also documented by WGFD	prairie dog colonies, western US	Chase <i>et al</i> , 1982; Clark <i>et al</i> , 1982
	ground nesting birds, including sage grouse and burrowing owls	inferred from vulnerability to trampling of birds nesting on beaches and crushed nests from ORV use in deserts; also documented by WGFD	beaches on New Jersey coast; deserts in California	Burger, 1995; Luckenbach, 1978
mortality from toxic compounds	waterfowl, muskrats	inferred from increased metabolic rates due to increased thermal conductivity of oiled fur or feathers	laboratory studies	McEwan & Koelink, 1973; McEwan <i>et al</i> , 1974
	waterfowl eggs, adult waterfowl, domestic livestock	petroleum intoxication is fatal to waterfowl, cattle and presumably wild ruminants; petroleum coating waterfowl eggs is toxic to embryos	field and laboratory studies	Hartung & Hunt, 1966; Leepen, 1976; Edwards <i>et al</i> , 1979; Peterle, 1991
	wildlife (birds, mammals) mortality at open drilling pits	inferred from studies of wildlife mortality at petroleum pits to which they are attracted, become trapped, drown or die from oil toxicity	petroleum pits in Texas, Wyoming	Flickinger, 1981; Flickinger & Bunck, 1987; Esmoil & Anderson, 1995
	aquatic insects, fish	diesel fuels and lube oils are much more toxic to aquatic organisms than more volatile gasoline and jet fuel or heavier crude oil	nationwide and laboratory studies	Markarian <i>et al</i> , 1994
degradation of aquatic habitats	aquatic insects, fish, amphibians	inferred from studies showing accumulation of organic materials in water leads to decay, oxygen depletion; erosion increases sediments that reduce light penetration and photosynthesis by aquatic plants; sediments fill substrate interstices, detrimental to macroinvertebrates, spawning habitat and egg survival	aquatic habitats in western US	Burns, 1972; Megahan & Kidd, 1972; Ringler & Hall, 1975; Patton, 1973; Reid, 1993
fragmentation of habitats	breeding passerine birds	habitat occupancy by obligate shrub-steppe bird species declines with reduced shrub (sagebrush) cover and reduced shrub patch size	sagebrush steppe in western US, southern Idaho	Braun <i>et al</i> , 1976; Knick & Rotenberry, 1995
	small mammals	roads act as filters or barriers to animal movements by dividing habitats, especially wide roads with high speeds, high traffic volume	highways world-wide	Bennett, 1991
impedance of migration	elk, deer, moose	berms and large diameter pipelines on ground or set on blocks are visual and physical barrier to movements	oil and gas developments in Alberta	Morgantini, 1985
	pronghorn	net-wire fencing associated with highways can prohibit pronghorns from reaching winter range and lead to significant winter mortality	Interstate 80, southcentral Wyoming	Riddle & Oakley, 1973

**Table 4-45
Continued**

Impact Type	Species-Group-Habitat	Documented or Inferred Effects	Circumstances - Location	Sources
hastening of migration	pronghorn	inferred hastening of migration can result in pressure on other ranges	industrial activity	WGFD
loss of forage	herbivores	once removed, shrub-dominated vegetation may take decades to revegetate; shrub species do not readily regenerate from seed in topsoil	sagebrush steppe in Intermountain west	Beauchamp <i>et al</i> , 1975; West, 1988
diminished use of habitats - interruption of life history functions	mule deer	areas within 0.125 mile of roads tend to be avoided; mule deer density was less (not significantly) within 0.6-mile radius of well drilling; mule deer mostly vacated a 0.5-mile area around well recompletion activities during winter; migratory mule deer avoid human disturbances more than resident deer	front range of Colorado; oil fields in central and western Wyoming; southern California	Rost & Baily, 1979; Easterly <i>et al</i> , 1991; Reeve, 1996; Nicholson <i>et al</i> , 1997
	pronghorn	effects of roads and well pads inferred from study showing pronghorn does with fawns escape from vehicles more than other groups; pronghorn density was lower within 0.6 mile of well drilling than beyond that distance	construction in southcentral Wyoming; oil field in central Wyoming	Reeve, 1984; Easterly <i>et al</i> , 1991
	moose	moose vacated open areas within 820 feet of vehicles and were unlikely to be within 0.6 mile of seismic activity; moose use roads plowed, free from snow but escape from trucks, snowmobiles, people on snowshoes or skis	oil field development in Alberta and western Wyoming	Horejsi, 1979; Rudd & Irwin, 1985
	sage grouse	inferred from observations and studies emphasizing importance of sound and auditory stimuli produced by males to attract females; noise pollution could diminish lek attendance and reproduction	coal mines in Montana, behavioral studies in Intermountain west	Eng <i>et al</i> , 1979; Vehrencamp & Bradbury, 1989; Gibson, 1989, 1992, 1996
	nesting and wintering raptors	disturbance during nesting may cause nest abandonment, egg and/or chick mortality. Some species (red-tailed hawk, golden eagles, prairie falcons) more tolerant than others (ferruginous hawks, bald eagles). Wintering rough-legged are more sensitive to vehicles within 550 feet of perch than wintering golden eagles	studies of effects of various impact sources throughout western US	Fyfe & Olendorff, 1976; GYE Bald Eagle Working Team, 1983; White & Thurrow, 1985; Grier & Fyfe, 1987; Andersen <i>et al</i> , 1990; Holthuijzen <i>et al</i> , 1990; Holmes <i>et al</i> , 1993
	breeding passerines	inferred from studies showing effects of well-traveled highways diminished breeding bird density; dust-shadow associated with dirt roads reduced densities of ground-nesting birds	highways in the Netherlands; oil pipeline studies in Alaska	Hanley <i>et al</i> , 1980; van der Zande <i>et al</i> , 1980
Secondary Impacts				
increased recreational use	various wildlife species	extensive reviews indicate a wide variety of human recreational activities impact wildlife causing death, displacement, habitat modification, and pollution	summaries of studies done nationwide	Knight & Gutzwiller, 1995
recreational ORV use	various wildlife species	off-road vehicles in desert ecosystems reduce numbers of breeding birds, small mammals and reptiles	deserts in southwest US	Carter, 1974; Luckenbach, 1978; Bury, 1980
encroachment in winter range by subdivisions	big game, various wildlife species	development of residential areas, resorts, campgrounds, summer and winter homes degrade lower elevation big game winter ranges and habitats used by other wildlife species; direct mortality due to vehicles, poaching, free-ranging dogs increases	big game winter ranges in Intermountain west, Colorado	Neil <i>et al</i> , 1975; Mower & Smith, 1989; Henderson & O'Herren, 1992

Table 4-45 Concluded				
Impact Type	Species-Group-Habitat	Documented or Inferred Effects	Circumstances - Location	Sources
domestic dogs and cats	various wildlife species	domestic dogs and cats directly kill wildlife ranging from rodents to big game; wildlife alarm responses to dogs may be greater than to native predators	nationwide, Colorado	Hamerstrom <i>et al</i> , 1965; George, 1974; Lowry & McArthur, 1978; Bangs <i>et al</i> , 1982; Neil <i>et al</i> , 1975
poaching	big game, furbearers	poaching big game and furbearers appears to increase concurrent with industrialization, influx of people	oil pipeline in Alaska; phosphate mines in SE Idaho	Klein, 1979; Kuck, 1986

black-footed ferrets according to existing USFWS (1989) guidelines. Given available information that supports absence of black-footed ferrets on the PAPA and application of these procedures and coordination with USFWS, none of the project alternatives would adversely affect black-footed ferrets.

Bald Eagle. USFWS has proposed to remove the bald eagle from the List of Endangered and Threatened Wildlife⁹. Removal of the bald eagle as a threatened species under ESA will not affect the species' protection under other Federal laws, principally the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act, as well as state laws. Currently, these protective laws, the ESA, and BLM's standard stipulations applied to surface disturbances near bald eagle nests still apply.

Bald eagles have been documented nesting and wintering within the PAPA and one nest on private lands and minerals has been active for at least the past two years. Sources of direct mortality of bald eagles include intentional or accidental shooting and collisions of eagles with vehicles. Since wintering bald eagles in some areas feed on big game carrion, they could suffer direct mortalities if struck by vehicles while feeding at roadsides. It is unlikely that slow moving construction vehicles would inadvertently kill eagles feeding on carcasses but personnel vehicles driven to and from construction sites and construction-related traffic on U.S. Highway 191 and State Highway 351 would be more likely to kill eagles feeding on roadkill. Such mortalities have been recorded elsewhere in western Wyoming where bald eagles feed on big game carcasses along highways and on big game winter ranges (Lockwood, 1992).

Studies on the effects of human activities on bald eagles have focused on toxicity of environmental contaminants, habitat losses and alterations, and behavioral responses by eagles to disturbances. Since bald eagles tend to avoid human activities during all times of year, construction activities can temporarily displace eagles during their migration, winter, and nesting periods. However, disturbances to eagles when they are migrating will probably not displace them from habitats that are key to their survival because other equally suitable habitats are available.

During winter, bald eagles perch near food sources (Stalmaster and Newman, 1979; DellaSala *et al.*, 1989) and displacement from perches may cause

them to occupy less optimal foraging habitats and increase their energy expenditures due to flight (Stalmaster and Gessaman, 1984). USFWS (1986) recommended that key bald eagle winter habitats be protected from disturbances from November 15 to March 15 with 0.25 mile buffer zones around nests, nocturnal roosts, and shorelines of feeding waters. Buffer zones of 0.5 mile (2,640 feet) at nest and roost sites (including perches) were recommended to regulate activities if eagles at those sites had line-of-sight views of the activities (USFWS, 1986).

Bald eagle nesting territories in the Greater Yellowstone Ecosystem (GYE) and elsewhere have been abandoned as a result of human activities (GYE Bald Eagle Working Team, 1983). One study indicated that nesting bald eagles flushed from nests when approaching humans were an average of 1,500 feet (range of 187 to 3,250 feet) from the nest (Fraser *et al.*, 1979 cited in GYE Bald Eagle Working Team, 1983). In the PAPA, establishment of a zone excluding surface disturbances or occupancy within 2,000 feet of bald eagle nests and exclusion of any construction activities within one mile of the nest during the nesting period would probably provide sufficient protection for nesting eagles. However, annual monitoring of nest site(s) would provide information on the success of those measures.

Whooping Crane. The USFWS designated the Rocky Mountain population of whooping cranes as experimental and nonessential in 1997¹⁰. Since the cross-fostering program at Grays Lake National Wildlife Refuge was discontinued in 1989, whooping crane occurrence along the Green River near the PAPA has ceased: the Grays Lake population of cranes has been declining from 13 known to be alive in March, 1990 to four in 1995. As a nonessential experimental population, the potential presence of whooping cranes from the Grays Lake population do not require formal consultation with USFWS but Federal programs are required to conserve the species nevertheless. Because their occurrence within the PAPA is less and less likely in the foreseeable future, none of the project alternatives would affect whooping cranes.

Humpback Chub, Bonytail Chub, Colorado Pikeminnow, Razorback Sucker. These four species of endangered fish inhabit the Green River and Colorado River drainages in Utah and Colorado, downstream from the PAPA. Because the Flaming Gorge and Fontenelle dams and reservoirs intercept

⁹See Federal Register: July 6, 1999, 64(128):36453-36464.

¹⁰See Federal Register July 21, 1997, 62(139): 38932-38939.

sediments discharged from drainages on PAPA, there are no effects to these species anticipated from increased sedimentation that might originate from any of the project alternatives. Indeed, the species are adapted to turbid conditions and it is highly unlikely that sedimentation caused by project actions would in any way adversely affect their survival.

Water withdrawals from the Green River drainage (including both surface and groundwater) have slight potential to directly affect these endangered fishes and meet the jeopardy standards defined for these four species. The USFWS determination is based on the recognition that continued water withdrawal has restricted the ability of the Colorado River system to produce flow conditions required by various life stages of the fish species, adversely affecting the species and their critical habitats downstream. To offset impacts, USFWS requires a one-time contribution to the recovery program in the amount of \$14.39 per acre-foot (in 1998 dollars). The fee is used to assist in the recovery of the species. USFWS has concluded for other similar projects that with the inclusion of this conservation measure, the project alternatives would not be likely to jeopardize the continued existence of the four Colorado River endangered fish species.

Water used for drilling wells on the PAPA (3.2 acre-foot/well) would be taken from water wells. Water withdrawn, whether from surface waters or from wells that are considered to be recharge water to the Green River drainage, the operators would be required to pay the fee to the conservation fund once in the year that withdrawals occurred for each acre-foot over 100 acre-feet. Fees would most likely be assessed at the APD review stage prior to any well drilling.

Proposed Wildlife Species. The mountain plover was proposed for listing as threatened by the USFWS on February 16, 1999¹¹. They have been observed within the PAPA and are expected to occur within limited habitat of mixed grasslands (11,774 acres) and desert shrub vegetation (11,519 acres). Conversion of rangeland and prairies to agriculture, mortality incurred during agricultural practices and operations in cultivated fields, and practices designed to emphasize grazing by domestic livestock over maintaining presence of other organisms (introduction of exotic plant species, eradication of burrowing mammals) on which mountain plovers are somewhat dependent during the nesting period have been cited

as factors contributing to their decline (Federal Register, February 16, 1999, 64(30):7587-7601.).

Since mountain plovers nest on the ground, adult birds, young and eggs are susceptible to mortality by vehicles and construction equipment, especially along 2-track range roads and undeveloped areas within the PAPA. So too, are they vulnerable to predation by a variety of mammals, raptors and loggerhead shrikes (Dinsmore, 1983). In addition, mountain plovers are susceptible to shooting (Dinsmore, 1983) and even though they are protected under the Migratory Bird Treaty Act, they could suffer mortality from indiscriminate shooting where prairie dogs and ground squirrels are used for target practice.

Prior to any surface disturbing activities, BLM would require project proponents to examine suitable nesting habitats for mountain plovers and conduct surveys according to existing USFWS guidelines if disturbances would occur in appropriate habitats (Appendix A). With application of these guidelines and coordination with USFWS, mountain plovers are not expected to be affected by any of the project alternatives.

A population of Canada lynx exists west of the PAPA in the Wyoming Range and have been seen north, in the upper Green River drainage and vicinity of Togwotee Pass (Laurion and Oakleaf, 1998). While their occurrence on the PAPA is unlikely, lynx could move through the area especially as juveniles that might disperse from distant population centers (Reeve *et al.*, 1986). However, such occurrences are impossible to predict as are potential impacts due to any of the project alternatives.

Candidate Wildlife Species. Swift fox could be found using all upland habitats (173,654 acres) in the vicinity of the PAPA even though none have been documented in the area. Removal of vegetation from the project area may reduce prey species and potential swift fox habitat. This species is occasionally killed by vehicular traffic which has been estimated as contributing only five percent of annual swift fox mortality in one study (Rongstad *et al.*, 1989). Although little documentation exists, road kill are probably associated with high-speed thoroughfares. Unless new information becomes available documenting their local occurrence, swift fox populations are not expected to be impacted by any project alternatives.

¹¹ See Federal Register February 16, 1999, 64 (30):7587-7601.

Other Animal Species with Special Status. Species with some form of special status other than those Federally listed threatened and endangered species and candidate species and that could occur on or near the PAPA were listed on Table 3-32. Some are aquatic species (fish, amphibians), many are wetland-dependent, but others could be found in any of the upland habitats present on the PAPA. Impacts anticipated for other wildlife and aquatic resources and summarized on Table 4-45 could apply to species with special status. For species most likely to occur on the PAPA, specific impact descriptions follow.

Burrowing owls have been documented nesting in the PAPA where they are probably found in low vegetation (low density sagebrush and desert shrub).

Because they nest in burrows dug by mammals (prairie dogs and badgers), burrowing owls are susceptible to mortality by vehicles and excavation machinery. They appear to tolerate many types of human activities including vehicular traffic and construction noise (Marks and Ball, 1983) but it is assumed that disturbances near nest sites during the nesting period would influence nesting success. Burrowing owls have suffered mortality from indiscriminate shooting, particularly where prairie dogs and ground squirrels are used for target practice (Marks and Ball, 1983).

Long-billed curlews and loggerhead shrikes could be impacted if nests, eggs, or birds are destroyed by vehicles or foot traffic. Construction activities in dense sagebrush, conifer-sagebrush and greasewood vegetation could adversely impact nests and nesting activities of loggerhead shrikes while activities in low vegetation (dry playas, low density sagebrush, saltbush) could impact nests of long-billed curlews.

Along with surface disturbances associated with any project alternative, increased use of existing roads by project-related vehicles and ORV use by the public, particularly during hunting seasons, could eventually lead to direct impacts (mortality) and indirect impacts (habitat loss) on pygmy rabbits especially in high density sagebrush and short-horned lizards in grasslands, low density sagebrush, and desert shrub vegetation especially where there are sandy soils.

White-faced ibises, black terns, trumpeter swans and other WGFD bird species of concern with status 1 and 2 would be expected to occur in wetlands and waterbodies in the PAPA. Compliance with Federal

regulations (Section 404 of the Clean Water Act, Executive Orders 11988 and 11990) would reduce impacts to habitats for these species.

Plant Species with Special Status. No Federally listed threatened or endangered plant species would be affected by any project alternatives. Five plant species of concern (so classified by USFWS and/or BLM) potentially occur within the PAPA (see Table 3-32). Coordination with the BLM and botanical experts will be necessary to determine whether surveys for these species are warranted prior to implementation of the project alternatives. Impacts to these species would be avoided by alterations of facility locations on Federal lands and minerals. Impacts could occur on non-Federal lands and minerals.

Rare Plant Habitats. Impacts to these habitats would occur with the establishment of new roads through or near the habitats. Roads become corridors along which exotic species will be introduced into the rare plant species communities.

Compression. None of the proposed compressor station sites coincides with prairie dog colonies (potential habitat for black-footed ferrets and mountain plovers) or with forest-dominated riparian habitat that potentially could be used by bald eagles. The proposed Jonah Gas site in Section 3 (T31N, R109W) and Western Gas site in Section 4 (T30N, R108W) are both on mixed grasslands and the Ultra site in Section 16 (T31N, R108W) is on desert shrub vegetation. Mixed grasslands and desert shrub provide potential nesting habitats to mountain plovers. If any of these 3 sites is developed there would be a short- and long-term loss of 7 acres potentially used by mountain plovers.

Noise associated with any of the compressor station sites would be a long-term impact. Noise levels produced by 26,000 hp compressors are expected to approximate background noise levels on the PAPA of 37-39 dBA at 5,000 feet away (see Air Quality Technical Report). Although each of the 7 proposed sites is more than 5,000 feet from the known bald eagle nest and potential bald eagle wintering habitat, varying amounts of mix grasslands and/or desert shrub vegetation occur within 5,000 feet of all proposed sites. Consequently, noise could affect potential mountain plover nesting habitat over the long-term, regardless of which site is developed. However, the Western Gas site in Section 24 (T29N, R108W) in the Jonah Field would be adjacent to their existing compressor station, and any potential noise

impact to nesting mountain plovers presumably would have already occurred within 5,000 feet of that location.

Sales Pipeline. The proposed sales pipeline route near Seedskaadee National Wildlife Refuge would be within bald eagle foraging areas and potential nesting and/or roosting sites. There is a bald eagle nest, last active in 1995, within one mile of the route as it crosses the Green River. If occupied, that nest site would be protected from construction-related disturbance by excluding activities within a one-mile zone during nesting and exclusion of any facility within 2,000 feet of the nest. The proposed route also passes through seven white-tailed prairie dog colonies, none of which have been surveyed for black-footed ferrets because burrow openings are less than 8 per acre, the density for which black-footed ferret surveys are required. Mountain plovers are known to occur on or near prairie dog colonies near Granger. If evidence suggests either species could be affected by pipeline construction, specific mitigation (avoidance) would be required.

A variety of special status species are known to occur or could potentially occur on or near the sales pipeline route near Seedskaadee National Wildlife Refuge and the Green River: Colorado River cutthroat trout, roundtail chub, flannelmouth sucker, American bittern, merlin, burrowing owl, trumpeter swan, and pygmy rabbit. Pipeline construction could impact some of these species if it disturbs suitable habitats, particularly wetlands (American bittern and trumpeter swan), riparian cottonwood forest (merlin), prairie dog colonies (burrowing owl), or basin big sagebrush (pygmy rabbit). In addition, two sensitive plant species, Opal phlox and echo spring-parsley occur in the vicinity of the route but preliminary indications are that neither would be affected by construction in the pipeline corridor (BLM, 1998a).

BP Amoco Field Office. This project component would disturb 5 acres of sagebrush steppe vegetation and the site would not coincide with any known or potential habitats used by black-footed ferrets, bald eagles or mountain plovers.

4.18.3.2 Project Wide Exploration/Development Scenario

Standard Stipulations Alternative. Protection to Federally listed threatened and endangered species exists under all project alternatives whether by

protection of specific habitats or through coordination between BLM, WGFD, and USFWS.

The one bald eagle nest within the PAPA is on private lands and minerals. Exclusion of surface disturbances within 2,000 feet surrounding the nest would be imposed on Federal lands and minerals. Also, BLM would impose a timing stipulation that excludes surface occupancy within one mile of the nest during the nesting period. However, up to 16 well pads/section could be located near the nest since sections adjacent to the nest site are also private lands with private minerals ownership. Consequently, areas surrounding the nest could experience some of the highest well densities in the PAPA. Alternatively, no wells could be drilled in the nest vicinity if exploration demonstrates the absence of natural gas reserves there.

Other BLM standard stipulations that limit surface disturbances for other resources on Federal lands and minerals in the PAPA would also provide some protection to habitats used by bald eagles as well as other listed (potential black-footed ferret habitat) and proposed (mountain plover nesting habitat) species, habitats that are not specifically targeted by protective measures. Those standard stipulations are in Table 2-8 and include:

1. avoiding production equipment within 350 feet of occupied dwellings on private and state lands and within 0.25 mile on Federal lands and minerals;
2. avoiding well pads within 0.25 mile of BLM developed recreation sites;
3. limitation of well pad density to 4 wells per section in the Wind River Front SRMZ;
4. limiting well pads within VRM Class II areas and avoidance of pads on slopes \geq 25 percent within VRM Class II areas;
5. avoidance of visible production equipment within 0.25 mile of the Lander Trail (or visible horizon, whichever is closer);
6. avoiding wells within 500 feet of riparian zones, wetlands and perennial streams and within 100 feet from ephemeral and intermittent streams with no defined riparian characteristics;
7. avoiding well pads on slopes $>$ 25 percent;
8. avoiding well pads within 100-year flood plains;
9. avoiding well pads, roads, aboveground structures within 0.25 mile of active sage grouse leks; and
10. avoiding well pads within 825 feet of active raptor nests (within 2,000 feet of active bald eagle nests).

These standard stipulations designed to protect other resources (listed above) will provide some protection to habitats likely to be used by threatened, endangered and proposed species. Bald eagles potentially use cottonwood trees in forest-dominated riparian habitat along rivers and streams to perch in while foraging during winter; mountain plovers potentially use prairie dog colonies, mixed grasslands and desert shrub as nesting habitats, and black-footed ferrets would be expected to inhabit white-tailed prairie dog colonies if they occur on the PAPA. However, none of these habitats have any protection, *per se*, but would be protected by standard stipulations targeting other resources. Areas for each habitat within the entire project area that would be protected by some standard stipulations are provided in Table 4-46 as well as the area of the same habitats with no protection. In areas of those habitats that would not fall under some standard stipulations there could be well densities ranging from zero up to 16 well pads/section constructed under the Project Wide Exploration/Development Scenario.

There are 4,052 acres of forest-dominated riparian habitat in the PAPA that are potential bald eagle foraging zones and are used for perching, particularly during winter. BLM standard stipulations would avoid well pads from being constructed on 633 acres of forest-dominated riparian habitat (Table 4-46). But project-wide, there are 3,389 acres which have no limitations to well densities so there could be as many as 85 well pads constructed within potential bald eagle foraging and perching habitats if densities of 16 well pads/section on non-Federal lands are realized. That potential number of well pads could occur whether development levels reach 500 or 700 well pads for producing wells in the project area.

Potential well pad densities can be translated to potential short-term and long-term impacts due to surface disturbance by using specifications in Table 2-9 and Table 2-10. By assuming that approximately 23 percent of all wells drilled anywhere within the project area will be dry holes (see Table 2-1), then 65 of the 85 wells that could be drilled in potential bald eagle wintering areas would be productive wells. Short-term surface disturbances associated with well pad construction, and construction of local and resource roads with adjacent gathering pipelines to producing well pads and roads only (no gathering pipelines adjacent) to dry hole well pads are the basis for estimating short-term impacts due to surface disturbance in Table 4-47. Similarly, specifications for reclaimed surfaces at well pads, roads and gathering

pipelines provided in Table 2-9 and Table 2-10 were applied to yield long-term impacts from surface disturbances in Table 4-47. It must be emphasized, however, that there may be no well pads constructed in forest-dominated riparian or any of the other habitats potentially used by listed and proposed species. The actual level of development and resultant well pad densities within any habitat not subject to BLM's standard stipulations cannot be determined but will depend on natural gas reserves found beneath those habitats.

There are 2,016 acres of prairie dog colonies that, because of existing standard stipulations, would not be disturbed but 3,787 acres of colonies would have no such stipulations applied (Table 4-46). As many as 16 well pads/section or as few as no pads/section could affect those 3,787 acres of prairie dog colonies in the PAPA. If maximum development occurs, there could be 95 well pads constructed in white-tailed prairie dog colonies across the project area. Potential short-term surface disturbance (642 acres) and long-term surface disturbance (194 acres) associated with that many well pads, roads and gathering pipelines are provided in Table 4-47.

Most prairie dog colonies on the PAPA are within mixed grassland and desert shrub vegetation, together they total 23,294 acres. Mountain plovers are expected to nest within these vegetation types as well as within prairie dog colonies. Of that total, 7,054 acres would be subject to one or more standard stipulations that avoid well pad locations in those habitats. But for the remaining 16,240 acres of mixed grassland and desert shrub that are not protected by any stipulation, up to 16 well pads/section could be developed. Conceivably, no wells might be drilled in those habitats.

Potential short-term and long-term impacts due to surface disturbance associated with the maximum possible well pads (producing and dry hole wells), roads and gathering pipelines are provided in Table 4-47. Within mixed grasslands and desert shrub project-wide, potential short-term surface disturbances could amount to 2,743 acres while expected long-term disturbance would be on 831 acres. That potential disturbance could occur whether development levels reach 500 or 700 well pads for producing wells in the project area. The potential for significant short- and long-term impact to

Table 4-46
Area of Potential Habitats for Black-footed Ferrets, Mountain Plovers, and Bald Eagles That Would Be Subject to BLM's Standard Stipulations on Federal Lands and Minerals under the Project Wide Exploration/Development Scenario

BLM's Standard Stipulations Applied to Federal Lands and Minerals	Area Within Potential Habitats for Listed and Proposed Species Not Specifically Protected by Standard Stipulations			
	Black-footed Ferrets and/or Nesting Mountain Plovers	Nesting Mountain Plovers		Bald Eagle Perching and Foraging Winter Habitat
	Prairie Dog Colonies	Mixed Grasslands	Desert Shrub	Forest-Dominated Riparian
Habitat Area Included in Standard Stipulations Protection	2,016 acres	3,327 acres	3,727 acres	633 acres
Habitat Area Not Included in Standard Stipulations Protection	3,787 acres	8,447 acres	7,793 acres	3,389 acres
Project Wide Habitat Area Total	5,803 acres	11,774 acres	11,520 acres	4,052 acres

Table 4-47
Potential Short-term and Long-term Impacts Due to Surface Disturbances in Potential Habitats for Black-footed Ferrets, Mountain Plovers, and Bald Eagles That Would Be Subject to BLM's Standard Stipulations on Federal Lands and Minerals under the Project Wide Exploration/Development Scenario

Potential Short-term and Long-term Impacts Based on Maximum Number of Possible Well Pads in Habitats (1)	Impacts to Potential Habitats for Listed and Proposed Species			
	Black-footed Ferrets and/or Nesting Mountain Plovers	Nesting Mountain Plovers		Bald Eagle Perching and Foraging Winter
	Prairie Dog Colonies	Mixed Grasslands	Desert Shrub	Forest-Dominated Riparian
POTENTIAL SHORT-TERM IMPACTS:				
Total Number of Well Pads Constructed - Acres Disturbed	95 pads - 351.5 ac	211 pads - 780.7 ac	195 pads - 721.5 ac	85 pads - 314 ac
Total Miles of Road & Gathering Pipeline - Acres Disturbed	29.2 mi - 247.8 ac	64.8 mi - 549.8 ac	60.0 mi - 509.1 ac	26.0 mi - 220.6 ac
Total Miles of Road Only to Dry Hole Pads - Acres Disturbed	8.8 mi - 42.7 ac	19.6 mi - 95.0 ac	18.0 mi - 87.3 ac	8.0 mi - 38.8 ac
Total Area Disturbed - Short-Term	642.0 acres	1,425.5 acres	1,317.9 acres	573.9 acres
POTENTIAL LONG-TERM IMPACTS:				
Total Number of Producing Well Pads - Acres Disturbed	73 pads - 109.5 ac	162 pads - 243.0 ac	150 pads - 225.0 ac	65 pads - 97.5 ac
Total Miles of Road & Gathering Pipeline - Acres Disturbed	29.2 mi - 84.9 ac	64.8 mi - 188.5 ac	60.0 mi - 174.5 ac	26.0 mi - 75.6 ac
Total Area Disturbed - Long-Term	194.4 acres	431.5 acres	399.5 acres	173.1 acres
1 = Values are based on acreage and assumptions specified in Tables 2-9 and 2-10 and include the following:				
- 23 percent of all well pads constructed will be for dry hole wells;				
- 3.7 acres/well pad will be disturbed short-term, 1.5 acres/producing well pad will be disturbed long-term, 0 acres/dry hole will be disturbed long-term;				
- 0.4 mile of road and gathering pipeline/producing well pad with 8.5 acres/mile disturbed short-term, 2.9 acres/mile disturbed long-term;				
- 0.4 mile of road only/dry hole well with 4.8 acres/mile disturbed short-term, 0 acres/mile disturbed long-term.				

nesting mountain plovers could be substantial if natural gas reserves coincide with mixed grasslands and desert shrub habitats and/or with prairie dog colonies.

There are 10,421 acres of wetlands in the PAPA that would not be subject to BLM's standard stipulations that require locating well pads 500 feet

away. Within these areas there are 259 potential well pad locations that could be within 500 feet of wetlands and where risk for sedimentation and accidental release of toxic materials would be most likely. Likewise, there are 9,070 acres within 100-year flood plains on non-Federal lands and lands with non-Federal minerals ownership that would not be subject to avoidance stipulations. Potentially, 232

well pads could be constructed in the 100-year flood plain (see Table 2-6).

Special status species that are dependent on aquatic habitats (western boreal toad, Columbia spotted frog, roundtail chub, bluehead sucker, flannelmouth sucker, Colorado River cutthroat trout) in the project area or downstream could suffer habitat degradation and/or mortality if sediments and/or toxic materials discharges entered water courses. There are numerous bird species that are dependent on wetland habitats, many of them with Native Species of Special Status 1, 2 and 3 (WGFD, 1998) that could be impacted if roads were located through wetlands.

Some of BLM's standard stipulations also limit timing of when surface disturbing activities can occur in specific wildlife habitats. In general, an average of 8 drilling rigs could be in operation project wide year-round under this alternative. The following standard stipulations would restrict activities in the project area so that drilling rigs would not be present in these areas during the restrictive period:

1. restrict construction activities within crucial antelope winter range during the period from November 15 through April 30;
2. restrict construction activities within mule deer winter range and crucial winter range on the PAPA during the period from November 15 through April 30;
3. restrict construction activities within crucial moose winter/yearlong range during the period from November 15 through April 30;
4. restrict construction activities within 2 miles of active sage grouse leks during the period from March 1 through June 30; and
5. restrict construction activities within 0.5 mile of active raptor nests - within 1 mile of active ferruginous hawk and bald eagle nests - during the period from February 1 through July 31.

Since most, if not all bald eagle wintering habitat coincides with moose, mule deer and/or antelope crucial ranges, drilling activities would not displace bald eagles from perch or feeding sites with stipulations relevant to those species in place, at least on Federal lands and minerals. That timing restriction would only apply to approximately 700 acres of forest-dominated riparian habitat so the remainder could be subject to drilling during the winter. Once wells in that area are drilled and producing, maintenance activities would occur year-round. Similarly, timing restrictions designed to protect areas surrounding sage grouse

leks and raptor nests would also benefit nesting mountain plovers since no drilling rigs would be allowed within those zones where they overlap potential nesting habitats during at least part of the mountain plover nesting season (mid-April through early July). Again, that limitation would only apply to Federal lands and minerals.

RP Alternative on Federal Lands and Minerals.

Specific measures to protect bald eagle nest sites under this alternative are the same as those described for the Standard Stipulations Alternative. Also, the various standard stipulations that apply some level of protection to other resources listed above, would also apply to surface disturbances under this alternative. BLM's standard stipulations would provide some level of protection to non-target areas that are potentially used by black-footed ferrets, bald eagles, and mountain plovers. Most often, that protection translates to avoiding well pads and other production activities within the target area.

Under the RP Alternative on Federal Lands and Minerals, additional resource protection measures would be imposed, some of which avoid well pads in specific areas and others that provide an upper limit to well pad densities in specific areas. Resource protection measures that in addition to standard stipulations would avoid well pads in specified areas but only on Federally owned lands and lands with Federal minerals ownership include:

1. avoid well pads within 0.25 mile of occupied dwellings, areas zoned for residential use by Sublette County, and subdivisions and subdivided lands;
2. avoid well pads within 0.25 mile of all recreation sites (not just BLM developed sites);
3. restrict or avoid well pads within VRM Class II areas (unless the operator and surface managing agency can arrive at an acceptable development plan to mitigate impacts);
4. avoid well pads within the Sensitive Viewshed SRMZ on slopes ≥ 15 percent; and
5. avoid well pads within the Mesa Breaks Management Area.

Additionally, the following areas that coincide with Federal lands and minerals ownership would be subject to limitations on well pad densities:

1. well pad densities limited to 4 pads/section in leases WYW130234, WYW8593 and part of

- WYW128255 to reduce impacts to recreation users along the Pinedale South and Mesa roads;
2. well pad densities limited to 4 pads/section in the Sensitive Viewshed SRMZ on slopes ≤ 15 percent;
 3. well pad densities limited to 2 pads/section visible from the Lander Trail within a zone from 0.25 to 1.5 miles from the trail;
 4. well pad densities limited to 8 pads/section within sub-basins draining to the Green River;
 5. well pad densities limited to 4 pads/section within Antelope Crucial Winter Range;
 6. well pad densities limited to 4 pads/section with Mule Deer Winter and Crucial Winter Ranges;
 7. well pad densities limited to 4 pads/section within Moose Crucial Winter/Yearlong Range;
 8. well pad densities limited to 4 pads/section within high quality Sage Grouse Nesting Habitat;
 9. well pad densities limited to 8 pads/section within lower quality Sage Grouse Nesting Habitat;
 10. well pad densities limited to 4 pads/section within the Blue Rim Area to protect sensitive soils and paleontological resources.

These resource protection measures that protect other resources by a) avoiding well pad placement in specific areas, and b) limiting well pad densities in specific areas would also provide protection and limit well pad drilling in areas potentially used by bald eagles, mountain plovers, and black-footed ferrets (if they occur).

The areas of those habitats that would be protected by standard stipulations and resource protection measures on Federal lands and minerals are provided in Table 4-48 as well as the area of the same habitats with no protection and on which up to 16 well pads/section could be constructed under either exploration/development scenario. Local reductions in well pad densities associated with this alternative would lead to less impact expected to special status species in upland habitats than under the Standard Stipulations Alternative. However, the same number of well pads could be potentially located within 500 feet of wetlands and within the 100-year flood plain under this alternative that was discussed under the Standard Stipulations Alternative.

There are 4,052 acres of forest-dominated riparian habitat in the PAPA that are potential bald eagle foraging zones and used for perching, particularly during winter. BLM standard stipulations and resource protection measures applied to Federal

lands and minerals would avoid well pads from being constructed on 676 acres and well pad densities would be limited to 4 pads/section on 738 acres (Table 4-48). But project-wide, there are 2,638 acres of forest-dominated riparian habitats which have no limitations to well densities. There could be as many as 71 well pads constructed within potential bald eagle foraging and perching habitats if densities of 16 well pads/section on non-Federal lands with no applicable protective measures are realized (Table 4-49). That potential number of well pads could occur whether development levels reach 500 or 700 well pads for producing wells in the project area.

Potential well pad densities can be translated to potential short-term and long-term impacts due to surface disturbance (Table 4-49) by using specifications outlined in Chapter 2 (Table 2-1, Table 2-9, Table 2-10) and using the same approach as in the Standard Stipulations Alternative, above. It must be emphasized, however, that there may be no well pads constructed in forest-dominated riparian or any of the other habitats potentially used by listed and proposed species.

There are 2,016 acres of prairie dog colonies that, because of existing standard stipulations and resource protection measures would not be disturbed. Well pad densities would be limited on 3,787 acres so that all prairie dog colonies would have some protection applied (Table 4-48). As many as 4 well pads/section or as few as no pads/section could affect those 3,787 acres of prairie dog colonies on the PAPA. If maximum development occurs, there could be 24 well pads constructed in white-tailed prairie dog colonies across the project area. Potential short-term surface disturbance (162 acres) and long-term surface disturbance (48 acres) associated with that many well pads, associated roads and gathering pipelines are provided in Table 4-49.

Mountain plovers may nest in mixed grassland and desert shrub vegetation, together totaling 23,294 acres on the project area. Well pads on 8,301 acres would be restricted or avoided and limited to 4 pads/section on 14,993 acres of those potential nesting habitats. The RP Alternative would avoid development of 16 well pads/section within any potential mountain plover habitat (Table 4-48). Potential short-term and long-term impacts due to surface disturbance associated with the maximum possible well pads (producing and dry hole wells), roads and gathering pipelines are provided in Table

Table 4-48
Area of Potential Habitats for Black-footed Ferrets, Mountain Plovers, and Bald Eagles That Would Be Subject to BLM's Standard Stipulations and Resource Protection Measures on Federal Lands and Minerals under the Project Wide Exploration/Development Scenario

BLM's Standard Stipulations and Resource Protection Measures Applied to Federal Lands and Minerals	Area Within Potential Habitats for Listed and Proposed Species Not Specifically Protected by Standard Stipulations			
	Black-footed Ferrets and/or Nesting Mountain Plovers	Nesting Mountain Plovers		Bald Eagle Perching and Foraging Winter Habitat
	Prairie Dog Colonies	Mixed Grasslands	Desert Shrub	Forest-Dominated Riparian
Habitat Area Where Well Pads would be Avoided	2,016 acres	4,574 acres	3,727 acres	676 acres
Habitat Area Where Limited Well Pads Would be Allowed	3,787 acres	7,200 acres	7,793 acres	738 acres
Habitat Area Not Included in Standard Stipulations or Resource Protection Measures	0 acres	0 acres	0 acres	2,638 acres
Project Wide Habitat Area Total	5,803 acres	11,774 acres	4,052 acres	4,052 acres

Table 4-49
Potential Short-term and Long-term Impacts Due to Surface Disturbances in Potential Habitats for Black-footed Ferrets, Mountain Plovers, and Bald Eagles That Would Be Subject to BLM's Standard Stipulations and Resource Protection Measures on Federal Lands and Minerals under the Project Wide Exploration/Development Scenario

Potential Short-term and Long-term Impacts Based on Maximum Number of Possible Well Pads in Habitats (1)	Impacts to Potential Habitats for Listed and Proposed Species			
	Black-footed Ferrets and/or Nesting Mountain Plovers	Nesting Mountain Plovers		Bald Eagle Perching and Foraging Winter Habitat
	Prairie Dog Colonies	Mixed Grasslands	Desert Shrub	Forest-Dominated Riparian
POTENTIAL SHORT-TERM IMPACTS:				
Total Number of Well Pads Constructed - Acres Disturbed	24 pads - 88.8 ac	45 pads - 166.5 ac	49 pads - 181.3 ac	71 pads - 262.7 ac
Total Miles of Road & Gathering Pipeline - Acres Disturbed	7.2 mi - 61.2 ac	14.0 mi - 119.0 ac	15.2 mi - 129.2 ac	22.0 mi - 187.0 ac
Total Miles of Road Only to Dry Hole Pads - Acres Disturbed	2.4 mi - 11.5 ac	4.0 mi - 19.2 ac	4.4 mi - 21.1 ac	6.4 mi - 30.7 ac
Total Area Disturbed - Short-Term	161.5 acres	304.7 acres	331.6 acres	480.4 acres
POTENTIAL LONG-TERM IMPACTS:				
Total Number of Producing Well Pads - Acres Disturbed	18 pads - 27.0 ac	35 pads - 52.5 ac	38 pads - 57.0 ac	55 pads - 82.5 ac
Total Miles of Road & Gathering Pipeline - Acres Disturbed	7.2 mi - 20.9 ac	14.0 mi - 40.6 ac	15.2 mi - 44.1 ac	15.2 mi - 44.1 ac
Total Area Disturbed - Long-Term	47.9 acres	93.1 acres	101.1 acres	146.3 acres

1 = Values are based on acreage and assumptions specified in Tables 2-9 and 2-10 and include the following:

- 23 percent of all well pads constructed will be for dry hole wells;
- 3.7 acres/well pad will be disturbed short-term, 1.5 acres/producing well pad will be disturbed long-term, 0 acres/dry hole will be disturbed long-term;
- 0.4 mile of road and gathering pipeline/producing well pad with 8.5 acres/mile disturbed short-term, 2.9 acres/mile disturbed long-term;
- 0.4 mile of road only/dryhole well with 4.8 acres/mile disturbed short-term, 0 acres/mile disturbed long-term.

4-49. Within mixed grassland and desert shrub project-wide, potential short-term disturbances could amount to 636 acres while expected long-term disturbance would be on 194 acres and could occur whether development levels reach 500 or 700 well pads for producing wells in the project area.

The RP Alternative would limit the number of drilling rigs on the PAPA to 5 operating at any one time and the area north of the New Fork River would be further limited to just 2 drilling rigs operating at a time. As with standard stipulations, this resource protection measure would only apply to Federal lands and minerals. Under limitations imposed by resource protection measures and standard stipulations, bald eagle wintering habitat would not be protected any more than under the Standard Stipulations Alternative since most forest-dominated riparian habitat is on private lands and minerals. Limiting the number of operating drilling rigs though, would reduce potential impacts to mountain plovers during the nesting period. That potential benefit would also apply to the pad drilling and Centralized production facilities options, below.

Pad Drilling. Pad drilling could be implemented on 738 acres of forest-dominated riparian habitat that, because of resource protection measures, would be limited to development of 4 well pads/section. The remaining 2,638 acres of potential bald eagle winter habitat in the PAPA could be maximally developed to 16 well pads/section, drilled using conventional procedures. If this approach is used, expected short-term disturbance to 4,877 acres potentially could occur if 5 well pads are developed for drilling multiple wells (with surface disturbances of 5 acres/well pad) and 66 well pads are developed for single wells in potential bald eagle wintering habitats. Since half of the 5 acre pads with multiple wells could be reclaimed, expected long-term surface disturbance impact would be 1,522 acres, slightly more disturbance than under the RP Alternative (Table 4-49) because of the larger surface area required for each multiple well pad.

Similarly, 3,787 acres of white-tailed prairie dog colonies could be subject to pad drilling - those areas for which resource protection measures would limit well pads to 4 pads/section. If multiple well pads were developed in all available prairie dog colonies, expected short-term disturbance would be 1,933 acres and 666 acres would be disturbed over the long-term, more than under the RP Alternative. And, 14,993 acres of mixed grasslands and desert shrub

vegetation that, under the RP Alternative, would have limitations of 4 well pads/section and could be developed with pad drilling. Expected short-term and long-term disturbances would be 7,599 and 267 acres, respectively.

If impacts of multiple well pads are compared to single well pad development, the area of short- and long-term disturbance would increase for the same number of well pads constructed but decrease for the same number of wells drilled. Pad drilling, however, would concentrate human activities more than single well pads for the same number of producing wells. Clumped disturbance will, in general, produce less impact to wildlife habitats than dispersed disturbance (Theobald *et al.*, 1997).

Centralized Production Facilities. Implementation of centralized production facilities in any of the habitats discussed above has the potential to increase short-term impacts: up to 16 well pads/section could be developed on any area on which stipulations and/or resource protection measures fully avoid surface disturbances. Each centralized production facility would disturb 5 acres over the short- and long-term. However, each of the well pads developed under this plan could be reclaimed to where only 0.5 acre would remain disturbed over the long-term. Human presence at each of the well pads would be reduced or nearly eliminated over the long-term. With these features, surface disturbances in wintering bald eagle perching and foraging habitats and mountain plover nesting habitats could be comparable to levels of short-term impact estimated for the Standard Stipulations Alternative, above. But long-term disturbances in these habitats would be considerably reduced.

RP Alternative on All Lands and Minerals. Under the Resource Protection Alternative on All Lands and Minerals, all of BLM's standard stipulations and the additional resource protection measures that were discussed above would apply to all lands and minerals, regardless of ownership. Noted above, some stipulations and protection measures would exclude well pads in specific areas while others provide an upper limit to well pad densities in specific areas and still others limit surface disturbing actions within specific habitats during critical times of year.

Consequently, protective measures applied to all lands within the PAPA would provide maximum protection to habitats likely to be used by bald eagles, mountain plovers, and black-footed ferrets. The

Table 4-50
Area of Potential Habitats for Black-footed Ferrets, Mountain Plovers, and Bald Eagles That Would Be Subject to BLM's Standard Stipulations and Resource Protection Measures on All Lands and Minerals under the Project Wide Exploration/Development Scenario

BLM's Standard Stipulations and Resource Protection Measures Applied to Federal Lands and Minerals	Area Within Potential Habitats for Listed and Proposed Species Not Specifically Protected by Standard Stipulations			
	Black-footed Ferrets and/or Nesting Mountain Plovers	Nesting Mountain Plovers		Bald Eagle Perching and Foraging Winter Habitat
	Prairie Dog Colonies	Mixed Grasslands	Desert Shrub	Forest-Dominated Riparian
Habitat Area Where Well Pads would be Avoided	2,016 acres	4,758 acres	3,727 acres	3,810 acres
Habitat Area Where Limited Well Pads Would be Allowed	3,787 acres	7,016 acres	7,793 acres	242 acres
Habitat Area Not Included in Standard Stipulations or Resource Protection Measures	0 acres	0 acres	0 acres	0 acres
Project Wide Habitat Area Total	5,803 acres	11,774 acres	11,524 acres	4,052 acres

Table 4-51
Potential Short-term and Long-term Impacts Due to Surface Disturbances in Potential Habitats for Black-footed Ferrets, Mountain Plovers, and Bald Eagles That Would Be Subject to BLM's Standard Stipulations and Resource Protection Measures on All Lands and Minerals under the Project Wide Exploration/Development Scenario

Potential Short-term and Long-term Impacts Based on Maximum Number of Possible Well Pads in Habitats (1)	Impacts to Potential Habitats for Listed and Proposed Species			
	Black-footed Ferrets and/or Nesting Mountain Plovers	Nesting Mountain Plovers		Bald Eagle Perching and Foraging Winter Habitat
	Prairie Dog Colonies	Mixed Grasslands	Desert Shrub	Forest-Dominated Riparian
POTENTIAL SHORT-TERM IMPACTS:				
Total Number of Well Pads Constructed - Acres Disturbed	24 pads - 88.8 ac	44 pads - 162.8 ac	49 pads - 181.3 ac	2 pads - 7.4 ac
Total Miles of Road & Gathering Pipeline - Acres Disturbed	7.2 mi - 61.2 ac	13.6 mi - 115.6 ac	15.2 mi - 129.2 ac	0.8 mi - 6.8 ac
Total Miles of Road Only to Dry Hole Pads - Acres Disturbed	2.4 mi - 11.5 ac	4.0 mi - 19.2 ac	4.4 mi - 21.1 ac	0 mi - 0 ac
Total Area Disturbed - Short-Term	161.5 acres	297.6 acres	331.6 acres	14.2 acres
POTENTIAL LONG-TERM IMPACTS:				
Total Number of Producing Well Pads - Acres Disturbed	18 pads - 27.0 ac	34 pads - 51.0 ac	38 pads - 57.0 ac	2 pads - 3.0 ac
Total Miles of Road & Gathering Pipeline - Acres Disturbed	7.2 mi - 20.9 ac	13.6 mi - 39.4 ac	15.2 mi - 44.1 ac	0.8 mi - 2.3 ac
Total Area Disturbed - Long-Term	47.9 acres	90.4 acres	101.1 acres	5.3 acres
1 = Values are based on acreage and assumptions specified in Tables 2-9 and 2-10 and include the following: <ul style="list-style-type: none"> - 23 percent of all well pads constructed will be for dry hole wells; - 3.7 acres/well pad will be disturbed short-term, 1.5 acres/producing well pad will be disturbed long-term, 0 acres/dry hole will be disturbed long-term; - 0.4 mile of road and gathering pipeline/producing well pad with 8.5 acres/mile disturbed short-term, 2.9 acres/mile disturbed long-term; - 0.4 mile of road only/dry hole well with 4.8 acres/mile disturbed short-term, 0 acres/mile disturbed long-term. 				

areas of those habitats that would be protected on all lands and minerals are provided in Table 4-50. Under the RP Alternative on All Lands and Minerals there would be no potential habitats for these species in which up to 16 well pads per square mile could be constructed. Local reductions in well pad densities associated with this alternative would minimize impacts expected to special status species in upland habitats. Further, there would be no well pads located within 500 feet of wetlands and within the 100-year flood plain.

There are 4,052 acres of forest-dominated riparian habitat in the PAPA that are potential bald eagle foraging zones and used for perching, particularly during winter. BLM standard stipulations and resource protection measures applied to all lands and minerals would restrict or avoid well pads from being constructed on 3,810 acres of forest-dominated riparian habitat and well pad densities would be limited to 4 pads/section on the remaining 242 acres (Table 4-50). There could be 2 well pads constructed within potential bald eagle foraging and perching habitats whether development levels reach 500 or 700 well pads for producing wells in the project area. Potential effects to wintering bald eagles by this alternative are much reduced from estimates made for the previous alternatives, primarily because so much private land coincides with forest-dominated riparian vegetation.

There are 2,016 acres of prairie dog colonies that, because of existing standard stipulations and resource protection measures would not be disturbed. Well pad densities would be limited on 3,787 acres (see Table 4-50). As many as 4 well pads/section or as few as no wells pads/section could affect those 3,787 acres of prairie dog colonies in the PAPA. If maximum development occurs, there could be 24 well pads constructed in white-tailed prairie dog colonies across the project area. Potential short-term surface disturbance (162 acres) and long-term surface disturbance (48 acres) associated with that many well pads, associated roads and gathering pipelines are provided in Table 4-51.

Mountain plovers may nest in mixed grassland and desert shrub vegetation, together totaling 23,294 acres in the project area. Well pads on 8,485 acres would be restricted or avoided and limited to 4 pads/section on 14,809 acres of those potential nesting habitats. The RP Alternative would avoid development of 16 well pads/section within any potential mountain plover habitat (Table 4-50)

Potential short-term and long-term impacts due to surface disturbance associated with the maximum possible well pads (producing and dry hole wells), roads and gathering pipelines are provided in Table 4-51. Within mixed grassland and desert shrub vegetation project-wide, potential short-term surface disturbances could amount to 629 acres while expected long-term disturbance would be on 1,922 acres and could occur whether development levels reach 500 or 700 well pads for producing wells in the project area. These amounts of potential impact are nearly identical to estimates made for the RP Alternative on Federal Lands and Minerals, indicating the limited amount of non-Federal lands coinciding with potential mountain plover nesting habitats.

The RP Alternative would limit the number of drilling rigs in the PAPA to 5 operating at any one time and the area north of the New Fork River would be further limited to just 2 drilling rigs operating at a time. Resource protection measures and standard stipulations applied to all lands in the project area would protect bald eagle wintering habitat more than under the either of the two previous alternatives since most forest-dominated riparian habitat is on private lands and minerals. Limiting the number of operating drilling rigs would also reduce potential impacts to mountain plovers during the nesting period. That potential benefit would also apply to the pad drilling and Centralized production facilities options, below.

Pad Drilling. Pad drilling could be implemented on the 242 acres of forest-dominated riparian habitat that, because of resource protection measures, would be limited to well pad densities of 4 pads/section. Well pad development would be excluded from the remaining 3,810 acres in potential bald eagle winter perching and foraging habitat in the PAPA. If this approach is used, expected short-term disturbance to 17 acres, 10 acres due to well pad construction and 77 acres due to construction of roads and gathering pipelines. Expected long-term surface disturbance impact would be 7 acres, substantially less than for any other alternative.

Similarly, 3,787 acres of white-tailed prairie dog colonies could be subject to pad drilling - those areas for which resource protection measures would limit well pads to 4 per section. Estimated short- and long-term areas of disturbance are 1,933 and 666 acres, respectively. And, 14,809 acres of mixed grasslands and desert shrub vegetation that, under the RP Alternative on All Lands and Minerals, would have limitations of 4 well pads/section could be developed

with pad drilling. Short-term and long-term areas of disturbance estimates are 750 and 264 acres, more disturbance than was estimated for the RP Alternative with no options. But, pad drilling would concentrate human activities more than single well pads for the same number of producing wells. Clumped disturbance will, in general, produce less impact to wildlife habitats than dispersed disturbance (Theobald *et al.*, 1997).

Centralized Production Facilities. Development of centralized production facilities in any of the habitats discussed above has the potential to increase short-term impacts. Expected long-term impact would be reduced well below levels estimated for other alternatives and options since all but 0.5 acre of each well pad could be reclaimed (except for the centralized production facilities pad) and, human presence at each of the well pads would be reduced or nearly eliminated over the long-term. With these features, surface disturbances in wintering bald eagle perching and foraging habitats and mountain plover nesting habitats could be comparable to levels of short-term impact estimated for the Standard Stipulations Alternative but long-term disturbances in these habitats would be considerably reduced.

4.18.3.3 Anticline Crest Exploration/ Development Scenario.

Standard Stipulations Alternative. The location of the one known bald eagle nest within the PAPA is more than 2 miles from the nearest potential development that would occur within the anticline crest. Therefore, if all development is restricted to this scenario, there would be no anticipated impacts to nesting bald eagles. However, there are 364 acres of potential bald eagle wintering habitat within forest-dominated riparian vegetation on the New Fork River that would not be subject to any of the standard stipulations (Table 4-52). If significant natural gas reserves are found beneath those sites, up to 16 well pads/section could be developed, whether at levels of 500 wells or 700 wells.

There could be anywhere from 0 to 9 well pads constructed on the anticline crest within potential bald eagle foraging and perching habitats if densities of 16 well pads/section on non-Federal lands and minerals with no applicable protective measures are realized. That potential number of well pads could occur whether development levels reach 500 or 700 well pads for producing wells in the project area. Potential

short-term and long-term impacts due to surface disturbance associated with 9 well pads (7 producing wells, 2 dry hole wells), and gathering pipelines are provided in Table 4-53. Short-term surface disturbances could be 61 acres while 19 acres of long-term disturbance would be expected if 9 wells were drilled in bald eagle wintering areas on the anticline crest.

There are 768 acres of prairie dog colonies on the anticline crest that, because of existing standard stipulations and resource protection measures would not be disturbed. But well pad densities on 1,313 acres of colonies could be as high as 16 well pads/section or none could be developed. If maximum development occurs, there could be 33 well pads constructed in white-tailed prairie dog colonies in the anticline crest. Potential short-term surface disturbance (2,233 acres) and long-term surface disturbance (677 acres) associated with that many well pads, roads and gathering pipelines are provided in Table 4-53.

An estimated 2,491 acres of mixed grassland and desert shrub vegetation would not be developed under standard stipulations. But, up to 137 well pads on 5,426 acres that are not protected by any stipulation could be developed. Conceivably, no wells would be drilled in those habitats. Potential short-term and long-term impacts due to surface disturbance associated with the maximum possible well pads (producing and dry hole wells), roads and gathering pipelines are provided in Table 4-53. Within mixed grasslands and desert shrub in the anticline crest, potential short-term surface disturbances could amount to 925 acres while expected long-term disturbance would be on 279 acres. That potential disturbance could occur whether development levels reach 500 or 700 well pads for producing wells in the project area. If natural gas reserves are discovered to coincide with mixed grasslands, desert shrub and prairie dog colonies the potential for significant short and long-term impact to nesting mountain plovers would be substantial.

An average of 8 drilling rigs could be in operation project wide year-round, all of which could be concentrated within the anticline crest. That level of concentrated activity could be a substantial local disturbance to wintering bald eagles and nesting mountain plovers. But standard stipulations would restrict activities in habitats on Federal lands and

Table 4-52
Area of Potential Habitats for Black-footed Ferrets, Mountain Plovers, and Bald Eagles That Would Be Subject to BLM's Standard Stipulations on Federal Lands Under the Anticline Crest Exploration/Development Scenario

BLM's Standard Stipulations Applied to Federal Lands and Minerals	Area Within Potential Habitats for Listed and Proposed Species Not Specifically Protected by Standard Stipulations			
	Black-footed Ferrets and/or Nesting Mountain Plovers	Nesting Mountain Plovers		Bald Eagle Perching and Foraging Winter Habitat
	Prairie Dog Colonies	Mixed Grasslands	Desert Shrub	Forest-Dominated Riparian
Habitat Area Included in Standard Stipulations Protection	768 acres	1,319 acres	1,172 acres	293 acres
Habitat Area Not Included in Standard Stipulations Protection	1,313 acres	3,244 acres	2,182 acres	364 acres
Anticline Crest Habitat Area Total	2,081 acres	4,563 acres	3,354 acres	657 acres

Table 4-53
Potential Short-term and Long-term Impacts Due to Surface Disturbances in Potential Habitats for Black-footed Ferrets, Mountain Plovers, and Bald Eagles That Would Be Subject to BLM's Standard Stipulations on Federal Lands under the Anticline Crest Exploration/Development Scenario

Potential Short-term and Long-term Impacts Based on Maximum Number of Possible Well Pads in Habitats (1)	Impacts to Potential Habitats for Listed and Proposed Species			
	Black-footed Ferrets and/or Nesting Mountain Plovers	Nesting Mountain Plovers		Bald Eagle Perching and Foraging Winter Habitat
	Prairie Dog Colonies	Mixed Grasslands	Desert Shrub	Forest-Dominated Riparian
POTENTIAL SHORT-TERM IMPACTS:				
Total Number of Well Pads Constructed - Acres Disturbed	33 pads - 122.1 ac	81 pads - 299.7 ac	56 pads - 207.2 ac	9 pads - 33.3 ac
Total Miles of Road & Gathering Pipeline - Acres Disturbed	10.0 mi - 85.0 ac	24.8 mi - 210.8 ac	17.2 mi - 146.2 ac	2.8 mi - 23.8 ac
Total Miles of Road Only to Dry Hole Pads - Acres Disturbed	3.2 mi - 15.4 ac	7.6 mi - 36.5 ac	5.2 mi - 25.0 ac	0.8 mi - 3.8 ac
Total Area Disturbed - Short-Term	222.5 acres	547.0 acres	378.4 acres	60.9 acres
POTENTIAL LONG-TERM IMPACTS:				
Total Number of Producing Well Pads - Acres Disturbed	25 pads - 37.5 ac	62 pads - 93.0 ac	43 pads - 64.5 ac	7 pads - 10.5 ac
Total Miles of Road & Gathering Pipeline - Acres Disturbed	10.0 mi - 29.0 ac	24.8 mi - 71.9 ac	17.2 mi - 49.9 ac	2.8 mi - 8.1 ac
Total Area Disturbed - Long-Term	66.5 acres	164.9 acres	114.4 acres	18.6 acres
1 = Values are based on acreage and assumptions specified in Tables 2-9 and 2-10 and include the following: <ul style="list-style-type: none"> - 23 percent of all well pads constructed will be for dry hole wells; - 3.7 acres/well pad will be disturbed short-term, 1.5 acres/producing well pad will be disturbed long-term, 0 acres/dry hole will be disturbed long-term; - 0.4 mile of road and gathering pipeline/producing well pad with 8.5 acres/mile disturbed short-term, 2.9 acres/mile disturbed long-term; - 0.4 mile of road only/dry hole well with 4.8 acres/mile disturbed short-term, 0 acres/mile disturbed long-term. 				

minerals on the anticline crest during winter and during part of the mountain plover nesting period. Because most of the bald eagle wintering areas are on private lands, the effect of timing stipulations is expected to be minimal.

RP Alternative on Federal Lands and Minerals.

There are 657 acres of forest-dominated riparian habitat on the anticline crest that are potential bald eagle foraging zones and are used for perching, particularly during winter. BLM standard stipulations and resource protection measures applied to Federal lands and minerals would restrict or avoid well pads from being constructed on 293 acres and well pad densities would be limited to 4 pads/section on 24 acres (Table 4-54). There are 340 acres of non-Federal lands and minerals which are in forest-dominated riparian habitats on which there could be as many as 9 well pads if densities of 16 well pads/section were to occur (Table 4-55). That potential number of well pads could occur whether development levels reach 500 or 700 well pads for producing wells in the anticline crest.

Mixed grassland and desert shrub vegetation on the anticline crest amount to 7,917 acres. Well pads on 2,937 acres would be avoided and development would be limited to 4 pads/section on 4,980 acres of potential mountain plover nesting habitat. The RP Alternative would avoid development of 16 well pads/section within any potential mountain plover habitat (Table 4-54).

Potential short-term and long-term impacts due to surface disturbance associated with the maximum possible well pads (producing and dry hole wells), roads and gathering pipelines are provided in Table 4-55. Within mixed grasslands and desert shrub on the anticline crest, potential short-term surface disturbances could amount to 209.8 acres while expected long-term disturbance would be on 644 acres and could occur whether development levels reach 500 or 700 well pads for producing wells in the project area.

The RP Alternative would limit the number of drilling rigs on the PAPA to 5 operating at any one time and the area north of the New Fork River would be further limited to just 2 drilling rigs operating at a time. As with standard stipulations, this resource protection measure would only apply to Federal lands and minerals.

Local reductions in well pad densities associated with this alternative would lead to less impact expected to special status species in upland habitats than under the Standard Stipulations Alternative. However, the same number of well pads could be potentially located within 500 feet of wetlands and within the 100-year flood plain under this alternative that was discussed under the SS Alternative.

Pad Drilling. Pad drilling could be implemented on the 24 acres of forest-dominated riparian habitat that, because of resource protection measures, would be limited to development of 4 well pads/section while 340 acres could be maximally developed to 16 well pads/section. Estimated short- and long-term impact would be similar to levels in Table 4-55.

Similarly, 1,313 acres of white-tailed prairie dog colonies on the anticline crest could be subject to pad drilling - those areas for which resource protection measures would limit well pads to 4 pads/section. And, 4,980 acres of potential mountain plover nesting habitat in mixed grasslands and desert shrub vegetation that, under the Resource Protection Alternative, would have limitations of 4 well pads/section could be developed with pad drilling. Expected short-term and long-term disturbances would be 250 and 88 acres, respectively.

If impacts of multiple well pads are compared to single well pad development, the area of short- and long-term disturbance will increase for the same number of well pads constructed but decrease for the same number of wells drilled. Pad drilling, however, would concentrate human activities more than single well pads for the same number of producing wells.

Centralized Production Facilities. Development of centralized production facilities in any of the habitats discussed, above has the potential to increase short-term impacts: up to 16 well pads/section could be developed on 1,313 acres of prairie dog colonies, 4,980 acres, combined, of mixed grasslands and desert shrub, 364 acres of potential bald eagle wintering habitat in forest-dominated riparian vegetation (Table 4-54). However, expected long-term impact would be reduced well below levels estimated for other alternatives and options because each well pad would be reclaimed so that only 0.5 acre would remain disturbed and daily or weekly well visits by maintenance personnel would be eliminated.

RP Alternative on All Lands and Minerals.
Under the Resource Protection Alternative on All

Table 4-54
Area of Potential Habitats for Black-footed Ferrets, Mountain Plovers, and Bald Eagles That Would Be Subject to BLM's Standard Stipulations and Resource Protection Measures on Federal Lands and Minerals under the Anticline Crest Exploration/Development Scenario

BLM's Standard Stipulations and Resource Protection Measures Applied to Federal Lands and Minerals	Area Within Potential Habitats for Listed and Proposed Species Not Specifically Protected by Standard Stipulations			
	Black-footed Ferrets and/or Nesting Mountain Plovers	Nesting Mountain Plovers		Bald Eagle Perching and Foraging Winter Habitat
	Prairie Dog Colonies	Mixed Grasslands	Desert Shrub	Forest-Dominated Riparian
Habitat Area Where Well Pads would be Avoided	768 acres	1,765 acres	1,172 acres	293 acres
Habitat Area Where Limited Well Pads Would be Allowed	1,313 acres	2,798 acres	2,182 acres	24 acres
Habitat Area Not Included in Standard Stipulations or Resource Protection Measures	0 acres	0 acres	0 acres	340 acres
Anticline Crest Habitat Area Total	2,081 acres	4,563 acres	3,354 acres	657 acres

Table 4-55
Potential Short-term and Long-term Impacts Due to Surface Disturbances in Potential Habitats for Black-footed Ferrets, Mountain Plovers, and Bald Eagles That Would Be Subject to BLM's Standard Stipulations and Resource Protection Measures on Federal Lands and Minerals under the Anticline Crest Exploration/Development Scenario

Potential Short-term and Long-term Impacts Based on Maximum Number of Possible Well Pads in Habitats (1)	Impacts to Potential Habitats for Listed and Proposed Species			
	Black-footed Ferrets and/or Nesting Mountain Plovers	Nesting Mountain Plovers		Bald Eagle Perching and Foraging Winter Habitat
	Prairie Dog Colonies	Mixed Grasslands	Desert Shrub	Forest-Dominated Riparian
POTENTIAL SHORT-TERM IMPACTS:				
Total Number of Well Pads Constructed - Acres Disturbed	8 pads - 29.6 ac	17 pads - 62.9 ac	14 pads - 51.8 ac	9 pads - 33.3 ac
Total Miles of Road & Gathering Pipeline - Acres Disturbed	2.4 mi - 20.4 ac	5.2 mi - 44.2 ac	4.4 mi - 37.4 ac	2.8 mi - 23.8 ac
Total Miles of Road Only to Dry Hole Pads - Acres Disturbed	0.8 mi - 3.8 ac	1.6 mi - 7.7 ac	1.2 mi - 5.8 ac	0.8 mi - 3.8 ac
Total Area Disturbed - Short-Term	53.8 acres	114.8 acres	95.0 acres	60.9 acres
POTENTIAL LONG-TERM IMPACTS:				
Total Number of Producing Well Pads - Acres Disturbed	6 pads - 9.0 ac	13 pads - 19.5 ac	11 pads - 16.5 ac	7 pads - 10.5 ac
Total Miles of Road & Gathering Pipeline - Acres Disturbed	2.4 mi - 7.0 ac	5.2 mi - 15.1 ac	4.4 mi - 12.8 ac	2.8 mi - 8.1 ac
Total Area Disturbed - Long-Term	16.0 acres	34.6 acres	29.3 acres	18.6 acres

1 = Values are based on acreage and assumptions specified in Tables 2-9 and 2-10 and include the following:

- 23 percent of all well pads constructed will be for dry hole wells;
- 3.7 acres/well pad will be disturbed short-term, 1.5 acres/producing well pad will be disturbed long-term, 0 acres/dry hole will be disturbed long-term;
- 0.4 mile of road and gathering pipeline/producing well pad with 8.5 acres/mile disturbed short-term, 2.9 acres/mile disturbed long-term;
- 0.4 mile of road only/dry hole well with 4.8 acres/mile disturbed short-term, 0 acres/mile disturbed long-term.

Lands and Minerals, all of BLM's standard stipulations and the additional resource protection measures that were discussed under the previous alternative would apply to all lands and minerals, regardless of ownership. Noted above, some stipulations and protection measures avoid well pads in specific areas while others provide an upper limit to well pad densities in specific areas.

Protective measures applied to all lands within the anticline crest would provide maximum protection to habitats likely to be used by bald eagles, mountain plovers, and black-footed ferrets. The areas of those habitats that would be protected on all lands and minerals are provided in Table 4-56. There would be no areas within potential habitats for these species that could be developed to densities of 16 well pads/section. All of the 657 acres of potential bald eagle winter habitat within the anticline crest would be exempt from any well pad development.

There are 937 acres of prairie dog colonies that would not be disturbed. Well pad densities would be limited on 1,144 acres of prairie dog colonies on the anticline crest to between 0 and 4 well pads /section (Table 4-56). This means that if maximum development occurs, there could be up to 7 well pads constructed in white-tailed prairie dog colonies on the anticline crest. Development of 7 well pads would produce potential short-term surface disturbance of 47 acres and long-term surface disturbance of 13 acres in white-tailed prairie dog colonies (Table 4-57).

Mountain plovers may nest in mixed grassland and desert shrub vegetation, together totaling 7,917 acres on the anticline crest. Well pads on 3,236 acres would be restricted or avoided and limited to 4 pads/section on 4,681 acres of those potential nesting habitats. This RP Alternative would avoid development of 16 well pads/section within any potential mountain plover habitat (Table 4-56). Within mixed grassland and desert shrub vegetation on the Crest, potential short-term surface disturbances could amount to 196 acres while expected long-term disturbance would be on 59 acres and could occur whether development levels reach 500 or 700 well pads for producing wells on the anticline crest. These levels of potential impact are very similar to estimates made for the RP Alternative on Federal Lands and Minerals, indicating the limited amount of non-Federal lands that coincide with potential mountain plover nesting habitats.

The RP Alternative would limit the number of drilling rigs on the PAPA to 5 operating at any one time and the area north of the New Fork River would be further limited to just 2 drilling rigs operating at a time. Resource protection measures and standard stipulations applied to all lands in the project area would protect all bald eagle wintering habitat since most forest-dominated riparian habitat is on private lands and minerals. Limiting the number of operating drilling rigs would also reduce potential impacts to mountain plovers during the nesting period. That potential benefit would also apply to the pad drilling and centralized production facilities options, below.

Pad Drilling. Pad drilling would not occur in forest-dominated riparian habitat. Within white-tailed prairie dog colonies, an estimated 1,144 acres could be subject to pad drilling - those areas for which resource protection measures would limit well pads to 4 per section. Estimated short- and long-term areas of disturbance are 56 acres and 18 acres, respectively. In other potential mountain plover nesting habitats, 4,681 acres of mixed grasslands and desert shrub vegetation that, under the RP Alternative on All Lands and Minerals, would have limitations of 4 well pads/section could be developed with pad drilling. Short-term and long-term areas of disturbance estimates are 23 acres and 81 acres, slightly more disturbance than was estimated for the RP Alternative with no options albeit with less expected impact because human activities would be concentrated on just a few areas. No pad drilling would occur in forest-dominated riparian vegetation on the anticline crest since all well pads development would be avoided under the RP Alternative on All Lands and Minerals. Hence, no impacts to wintering bald eagles would be expected.

Centralized Production Facilities. Centralized production would not occur in any potential bald eagle wintering habitat. Short-term impacts to potential mountain plover nesting habitats could be comparable to levels of short-term impact estimated for the Standard Stipulations Alternative but long-term disturbances in these habitats would be considerably reduced and human presence at each of the well pads would be reduced or nearly eliminated over the long-term.

4.18.3.4 No Action Exploration/Development Scenario. Implementation of the No Action Exploration/Development Scenario would eliminate potential project-related impacts to threatened, endangered,

Table 4-56
Area of Potential Habitats for Black-footed Ferrets, Mountain Plovers, and Bald Eagles That Would Be Subject to BLM's Standard Stipulations and Resource Protection Measures on All Lands and Minerals under the Anticline Crest Exploration/Development Scenario

BLM's Standard Stipulations and Resource Protection Measures Applied to Federal Lands and Minerals	Areas Within Potential Habitats for Listed and Proposed Species Not Specifically Protected by Standard Stipulations			
	Black-footed Ferrets and/or Nesting Mountain Plovers	Nesting Mountain Plovers		Bald Eagle Perching and Foraging Winter Habitat
	Prairie Dog Colonies	Mixed Grasslands	Desert Shrub	Forest-Dominated Riparian
Habitat Area Where Well Pads would be Avoided	937 acres	1,876 acres	1,360 acres	657 acres
Habitat Area Where Limited Well Pads Would be Allowed	1,144 acres	2,687 acres	1,994 acres	0 acres
Habitat Area Not Included in Standard Stipulations or Resource Protection Measures	0 acres	0 acres	0 acres	0 acres
Anticline Crest Habitat Area Total	2,081 acres	4,563 acres	3,354 acres	657 acres

Table 4-57
Potential Short-term and Long-term Impacts Due to Surface Disturbances in Potential Habitats for Black-footed Ferrets, Mountain Plovers, and Bald Eagles That Would Be Subject to BLM's Standard Stipulations and Resource Protection Measures on All Lands and Minerals under the Anticline Crest Exploration/Development Scenario

Potential Short-term and Long-term Impacts Based on Maximum Number of Possible Well Pads in Habitats (1)	Impacts to Potential Habitats for Listed and Proposed Species			
	Black-footed Ferrets and/or Nesting Mountain Plovers	Nesting Mountain Plovers		Bald Eagle Perching and Foraging Winter Habitat
	Prairie Dog Colonies	Mixed Grasslands	Desert Shrub	Forest-Dominated Riparian
POTENTIAL SHORT-TERM IMPACTS:				
Total Number of Well Pads Constructed - Acres Disturbed	7 pads - 25.9 ac	17 pads - 62.9 ac	12 pads - 44.4 ac	0 pads - 0 ac
Total Miles of Road & Gathering Pipeline - Acres Disturbed	2.0 mi - 17.0 ac	5.2 mi - 44.2 ac	3.6 mi - 30.6 ac	0 mi - 0 ac
Total Miles of Road Only to Dry Hole Pads - Acres Disturbed	0.8 mi - 3.8 ac	1.6 mi - 7.7 ac	1.2 mi - 5.8 ac	0 mi - 0 ac
Total Area Disturbed - Short-Term	46.7 acres	114.8 acres	80.8 acres	0 acres
POTENTIAL LONG-TERM IMPACTS:				
Total Number of Producing Well Pads - Acres Disturbed	5 pads - 7.5 ac	13 pads - 19.5 ac	9 pads - 13.5 ac	0 pads - 0 ac
Total Miles of Road & Gathering Pipeline - Acres Disturbed	2.0 mi - 5.8 ac	5.2 mi - 15.1 ac	3.6 mi - 10.4 ac	0 mi - 0 ac
Total Area Disturbed - Long-Term	13.3 acres	34.6 acres	23.9 acres	0 acres
1 = Values are based on acreage and assumptions specified in Tables 2-9 and 2-10 and include the following: - 23 percent of all well pads constructed will be for dry hole wells; - 3.7 acres/well pad will be disturbed short-term, 1.5 acres/producing well pad will be disturbed long-term, 0 acres/dry hole will be disturbed long-term; - 0.4 mile of road and gathering pipeline/producing well pad with 8.5 acres/mile disturbed short-term, 2.9 acres/mile disturbed long-term; - 0.4 mile of road only/dry hole well with 4.8 acres/mile disturbed short-term, 0 acres/mile disturbed long-term.				

candidate wildlife species and species with special status that have been described, above. However, impacts described as secondary or indirect in Table 4-45 would be expected to continue with any additional population growth in the region.

4.18.4 Additional Mitigation Opportunities.

The following measures would reduce potential impacts to Federally listed threatened and endangered species, candidate wildlife species, and special status species. The BLM can impose measures 4 and 5 on Federal lands. Adoption of all other measures would require input by other governmental entities or would be strictly voluntary on the part of the operator.

Threatened/Endangered Species Mitigation Opportunity 1. The operators should inform employees and contractors of all pertinent Federal and state laws, regulations, and policies that pertain to protection of listed threatened and endangered species, candidate species, and sensitive species. Failure of employees, contractors and subcontractors to adhere to state and Federal game laws as a condition of employment should be grounds for dismissal.

Threatened/Endangered Species Mitigation Opportunity 2. To minimize poaching, the operators should inform their employees, contractors and subcontractors that firearms are forbidden at work sites.

Threatened/Endangered Species Mitigation Opportunity 3. Similar to other projects on Federal lands in southwest Wyoming, the operators could adopt a policy of prohibiting dogs at work sites to reduce harassment of wildlife.

Threatened/Endangered Species Mitigation Opportunity 4. To minimize mortality of candidate and special status species (i.e. mountain plover and burrowing owls) found on prairie dog colonies, the BLM could close prairie dog towns to recreational shooting.

Threatened/Endangered Species Mitigation Opportunity 5. As part of the transportation planning process, the operators should identify: 1) unneeded roads and two-tracks that would be closed in coordination with BLM; 2) roads that would be closed to the public, especially during winter and late spring when listed and candidate bird species would be

nesting; and, 3) roads that would be closed to limit access to habitat utilized by wintering bald eagles.

4.18.5 Monitoring Recommendations. Where project sites would be located in potentially suitable habitats, surveys should be conducted to determine whether the area is being used by mountain plovers, burrowing owls, or loggerhead shrikes. If nesting species are found, no activities should occur within the utilized habitat during the reproductive period. Surveys to locate bald eagle roost trees, perch sites, and feeding areas along the New Fork River and Green River should be conducted to insure that appropriate mitigation measures (buffer areas, scheduling, etc.) are being implemented. No potential nest trees for bald eagles or other raptors should be removed during project construction in the Green River and New Fork River flood plains.

4.19 Wildlife and Aquatic Resources

4.19.1 Scoping Issues

General Wildlife Concerns

1. The first priority should be to maintain a healthy habitat for existing wildlife populations -- if this means cutting the number of wells then it should be done.
2. BLM should limit or even prohibit drilling and road and pipeline construction in some areas in order to protect wildlife populations.
3. Address impacts of habitat fragmentation on wildlife.
4. Need to develop innovative mitigation measures to protect wildlife.
5. Concerned about direct habitat loss as well as indirect habitat loss or displacement.
6. Minimizing travel and traffic will address a lot of wildlife concerns.
7. Evaluate the feasibility of pad drilling. Consider remote monitoring to reduce traffic and visits in the project area.
8. There should be phased development in areas critical to sage grouse and deer -- limit number of locations in a section that would be developed and restrict further development in that section until the effects of those wells are known and some of the existing locations are shut down.
9. All pits should be netted -- address measures to prevent migratory and other wildlife mortality in oil/gas field production pits.
10. Wildlife studies funded by Ultra should be expanded and continued.

11. Consider habitat enhancement to offset impacts in the project area.
12. Establish a 1 mile "no-development" corridor along U.S. Highway 191 to protect big game migration.
13. Address potential impacts to nongame species.
14. Describe project activities that have the potential to expose fish and wildlife to hazardous substances.
15. Some of the best wildlife habitat in the area occurs on private lands -- what will be done to protect wildlife on private lands.
16. Require 2 to 1 acreage offsets by the operators to replace wildlife habitat disturbed -- increase the ratio if more successful production is found.
17. Curtail non-essential operations during crucial wildlife periods.
18. Initiate a trust fund to be financed by the operators and government royalties and taxes to purchase habitat for wilderness conservation off limits to future industrial development.
19. As many wells as possible should be drilled off one pad and each pad carefully located with the cooperation of the Wyoming Game and Fish Department.
20. Winter timing restrictions must be strictly adhered to.
21. Leave key areas undisturbed while developing others.
22. Wildlife water should be protected -- opportunities to enhance water sources and supplies should be pursued.
24. Reclamation should include reestablishment of shrubs and should insure that all essential wildlife habitat components are restored.
25. Limit development to no more than 1 or 2 industrial locations per section and avoid big game crucial winter ranges, big game migration routes, and sage grouse dancing grounds.
26. Reservoirs, playas, and water wells should be avoided when planning roads and well pads.
27. Keep intact and update databases used to address cumulative wildlife impacts.
28. Adopt WGFD's no net loss of habitat function within the biological community of the New Fork River fishery.
29. Habitat degradation from the project will be minimal.
2. Antelope numbers are down -- antelope are being forced out by locations and tanks in and around the limited number of reservoirs.
3. Deer numbers are down.
4. Insure antelope and mule deer migration routes remain connected and unobstructed.
5. Identify historic elk migration routes and secure them.
6. Deny surface occupancy on migration routes and in birthing/nesting areas.
7. The Mesa should be closed between November 15 and May 1 to the public and the gas industry, not just in low snow years.
8. The Mesa should be closed longer in the spring if conditions warrant such a need, like a late or wet spring or an unusually early winter.
9. Address impacts of checking wells, plowing roads, and hauling condensate throughout the late fall, winter and spring months -- can these activities be somewhat curtailed during the winter months.
10. No development should occur on antelope, deer and moose habitat including winter range, summer range, migration routes, and calving areas
11. The idea that antelope and deer numbers are down and diminishing is ludicrous.

Sage Grouse Concerns

1. BLM should adhere to seasonal buffer zones for sage grouse contained in the Pinedale Resource Management Plan.
2. A lower density of wells should be considered to protect sage grouse habitat.
3. New roads should avoid active and inactive sage grouse leks.
4. No development should occur on sage grouse leks.
5. Preclude development within 2 miles of sage grouse leks.
6. Concerned about structures (i.e., tanks) providing perches and nest sites for raptors which could take sage grouse.
7. New roads will provide more hunter access to sage grouse and the take will increase.
8. An independent review of possible impacts to grouse and the adequacy of present stipulations should be included in the EIS.
9. The idea that irreparable harm will occur to sage grouse and lek areas is false and misleading.

Big Game Concerns

1. Limit development to no more than 2 locations per section to avoid decrease in winter range and migration routes.

4.19.2 Significance Criteria. Impacts to wildlife would be considered significant if any of the following occurs (refer to Table 4-44):

- increased mortality and/or decreased survival of native wildlife species considered as Vital, High, or Moderate by the WGFD Mitigation Policy;
- loss of habitat function and/or habitat value for habitats classified as Vital or High by the WGFD Mitigation Policy; or
- net loss of habitat value with alterations in habitat function for habitats classified as Moderate by the WGFD Mitigation Policy.

Using this criteria, significant impacts are predicted for a number of wildlife species.

4.19.3 Alternative Impacts

4.19.3.1 Summary of Impacts Common to All Alternatives (Except the No Action Exploration/Development Scenario). All of the above scoping concerns are addressed in this section, in Table 4-45, and in mitigation measures at the end of this section and in previous sections (see Chapter 2). Additional impacts that were not introduced through scoping comments (most of them indirect or secondary) are also described. Direct or primary impacts to wildlife are explicitly related to the action and include mortality of individuals, loss of habitat quantity and function and ultimately, diminished population-sustaining functions: individuals' survival and reproductive capacity are adversely affected. Direct impacts include:

- mortality from wildlife-vehicle collisions on or off project sites;
- mortality during road, pipeline and well-pad construction and other surface-disturbing actions;
- mortality due to consumption of or exposure to toxic compounds;
- fragmentation of connected habitats;
- removal of vegetation and other features such as rock-outcrops that provide habitat;
- degradation of terrestrial habitats from erosion and introduction of non-native vegetation;
- degradation of aquatic habitats due to altering stream banks, siltation and decreased water quality;
- loss of forage for herbivores;
- diminished animal use of habitats due to effects of noise, dust, emissions and human presence; and

- interruption or interference with life history functions including courtship, nesting and parturition, migration, and winter survival.

For some species, these direct impacts are expected to be interrelated such as the effects of habitat fragmentation on interference with life history functions. In addition, there will probably be indirect or secondary impacts that ensue with increased human population and/or increased human use (access) of an area. These evolve during and after a project but are functionally related: secondary impacts would not have occurred without the project. Once initiated though, secondary impacts may continue well beyond the time-frame and develop independently of the project (Comer, 1982). While the effects on wildlife of secondary impacts may be the same as primary, direct impacts, the sources of those impacts vary and include (Comer, 1982 page 18):

- increased recreation, especially off-road vehicles;
- increased habitat conversion, especially urban/suburban sprawl;
- habitat degradation by human encroachment;
- increased noise, air and water pollution;
- increased game poaching;
- increased wildlife road kills; and
- increased harassment of wildlife by uncontrolled pets, especially dogs.

The Pinedale RMP emphasizes maintaining habitats to support wildlife populations at 1987 objectives established by WGFD. But, that only applies to pronghorn, mule deer, elk and moose since there are no population objectives set for other game and nongame species. Since the approval of the RMP in 1987, the WGFD (1998) established a mitigation policy in which they recommend objectives for managing unavoidable adverse impacts to different categories of wildlife and wildlife habitats (Table 4-44). Wildlife habitats are evaluated by their function (the arrangement of habitat features that sustain species, populations and wildlife diversity over time), and their value (the relative importance of habitat types and conditions in sustaining wildlife populations). However, the policy offers no guidance for measuring habitat function, habitat value, or impact effects that would result in a loss of function or value.

Summarized in Table 4-44 are the WGFD's five mitigation categories related to the relative importance of habitats to fish and wildlife species. These mitigation categories and associated mitigation

objectives provide the basis for judging levels of impact significance.

Impacts to Federally listed threatened and endangered species and their respective critical habitats are identified as "irreplaceable": no loss of habitat or habitat function since neither can be replaced nor impacts mitigated. State rare wildlife species, Federal candidate species, state native species with status 1 and 2, species' crucial habitats, wetlands, and stream class 1 waterways (premium trout waters with fisheries of national importance) are identified as "vital": habitats may be modified but no loss of habitat function is recommended since these habitats directly limit communities and populations and it may not be possible to restore or replace the habitat once impacted.

State priority 2 species, raptors, migratory birds of high Federal interest, trophy game animals (mountain lions, black bears), big game and trophy game winter-yearlong ranges, parturition areas, raptor nesting habitats, riparian habitats, and other important or limited habitats have been identified as "high" importance: if impacts occur WGFD would recommend replacement of affected habitats or enhancement of similar habitats to achieve no net loss of habitat function of the community impacted by a project. Similarly, high values to fishery management include native game fish, stream class 2 waterways, and fisheries management programs emphasizing trophy, species and wild native game fish.

Wildlife and fish habitats identified in the "moderate" category may be common or of intermediate importance but WGFD recommends no loss of habitat values (the relative importance necessary to sustain socially or ecologically significant wildlife populations) and minimal loss of habitat function (capability of the habitat to sustain species, populations, wildlife diversity over time). Habitats in the "low" importance category are abundant or not essential to sustain wildlife populations or communities.

The state of knowledge about impacts to fish and wildlife due to natural gas development is meager and has not substantially progressed during the past 20 years. While the list of impacts identified by the public and agencies (most of them direct or primary) seems to grow with every project, NEPA practitioners base impact evaluations on assumption, conjecture and inference derived from studies of similar types of

actions but in diverse locations and on different but similar species. Documented or implied impacts that are applicable to PAPA alternatives are summarized in Table 4-45. These do not include effects of natural gas developments on species' populations; none have been studied or documented and hence the emphasis of impact analysis continues to be on wildlife habitat.

WGFD (1998) identified big game crucial winter range as a vital resource (Table 4-44) and recommends no loss of habitat function even though some modification of habitat characteristics may occur. The function of crucial winter range is to provide shelter and forage to big game, ensuring their survival during periods of significant winter stress. Crucial habitat, in general, is described as the determining factor in a population's ability to maintain and reproduce itself at a certain level (at least at the WGFD population objective) over the long-term.

Considering only the estimated surface disturbance and associated loss of vegetation that would occur under any of the alternatives, construction-related impacts would probably produce a significant impact if extensive development occurred in pronghorn and/or mule deer crucial winter ranges. The loss of the shrub component of the vegetation would be a long-term impact which could also result in a significant impact. For any of the alternatives, there would be an unknown amount of crucial winter habitat adjacent to roads and well pads that would be subject to human use and that would further reduce usable crucial winter habitat. Roads and well pads developed in this project would be accessed for maintenance activities once a well is operational except where centralized production facilities are developed, discussed below. Pronghorn response to low level human presence during winter and/or physical presence of roads or wells can only be hypothesized: wintering pronghorns are most likely to escape from approaching vehicles and/or vacate habitat adjacent to well field facilities (Easterly *et al.*, 1991).

Various data and studies conducted elsewhere support a similar hypothesis that mule deer can be affected by low level human presence during winter and/or physical presence of roads or operational well pads. Since winter 1992-1993, WGFD has collected data on mule deer wintering on the PAPA and vicinity that allow calculation of fawn and adult mule deer mortality rates over winter. Those data include counts of fawns and adults before winter (November), counts

of fawns and adults after winter (April), and counts of fawn and adult deer carcasses in April (McWhirter, 1998b). Similar data have been collected on winter ranges in the Wyoming Range Mule Deer Herd Unit (Fralick, 1998) which borders the Sublette Herd Unit. Using techniques developed by White *et al.* (1996), these empirical data provide estimates of fawn and adult mortality from winters 1992-1993 through 1997-1998 and show a strong relationship to winter precipitation data measured by National Oceanic and Atmospheric Administration (NOAA) cooperators in Pinedale.

As total winter precipitation (November through March) increases, so do fawn and adult mortality rates. In fact, winter precipitation explains 62 percent of the observed variation in fawn mortality rates (but only 27 percent of the variation in adult deer mortality rate). Not surprisingly, fawn mortality increases at a greater rate than adult mortality with increasing winter precipitation. In part, overwinter mortality of mule deer is due to snow depth since deep snow covers forage and increases energy expense for movements.

Parker *et al.* (1984) clearly demonstrated that energy costs associated with deer moving through snow increased exponentially as snow depth increased relative to the height of a deer or relative sinking depth of an animal in snow. Therefore, fawns expend more energy than adults moving through snow with similar depth and consistency (as dense vs. powdered snow). Increased energy expense or metabolic rate during winter is also promoted by operative temperatures (including combined effects of ambient temperature, wind, and solar radiation) that are below mule deer thermal neutral zones, below -2.2°F (Parker and Robbins, 1984). The combined effects of precipitation and temperature on deer winter survival have been discussed by numerous investigators (Roper and Lipscomb, 1973; Bartmann, 1984; Leckenby and Adams, 1986; Hobbs, 1989; Reeve and Lindzey, 1991; Reeve, 1998) and these are undoubtedly related to the differential observed winter mortality of fawn and adult deer in the Sublette Mule Deer Herd Unit as well as in the Wyoming Range Mule Deer Herd Unit (Fralick, 1998).

Human-related factors or events on winter ranges that cause mule deer to expend energy during winter, in addition to "natural" environmental factors (severe weather forcing migration, competition with conspecifics and/or other ungulates, predators) will increase their over-winter mortality and consequently diminish the function of those winter ranges. The

function of crucial and non-crucial winter ranges is to provide maximum overwinter survival. Wintering mule deer do vacate areas surrounding well pads during periods of concentrated human activity (Reeve, 1996) but their response to well maintenance operations along collector roads is more ambiguous (Easterly *et al.*, 1991; Reeve, 1996). Nevertheless, migratory mule deer appear to be more sensitive to human disturbances, remaining farther away from human disturbances than non-migratory deer (Nicholson *et al.*, 1997).

If wintering deer vacate areas surrounding well pads and/or roads on the PAPA, they will not expend additional energy escaping from vehicles or human presence but they will not utilize habitat features (forage, protective shelter) proximate to well field facilities. If deer continue to utilize habitats adjacent to well pads, roads or other facilities when humans are not present but escape some distance as workers approach, then those habitats will be less functional in providing winter survival since mule deer energy costs will be above expenditures on unaffected winter ranges. A third possibility, that mule deer may habituate to human presence, has been reviewed by Hayden-Wing Associates (1991). By habituating, deer would utilize habitats near well field facilities and decrease energetic costs of escape from human encounters. Some mule deer wintering on the PAPA are expected to habituate to well field operational activities. But most wintering deer migrate to those winter ranges and the majority are expected to avoid or escape from operational activities associated with natural gas development. And, because there is very little topographic relief on the Mesa *per se*, there are few areas where wintering big game can exist completely shielded from major winter storms or human activities.

The accumulated effects to wintering pronghorn and mule deer on crucial winter range by other types of impacts noted in Table 4-45 cannot be evaluated beyond brief disclosure - primary impacts include increased mortality from collisions with vehicles, mortality from ingesting toxic compounds, fragmented habitats, impeded migration, and secondary impacts include ORV use on winter range, construction of houses and subdivisions on winter ranges, attacks or alarm by domestic dogs and poaching are all possible by-products of any project alternative. Indeed, some of these already occur: wintering and migrating pronghorn and mule deer are killed on area highways (Wyoming Department of Transportation, unpublished

data) and houses have been built in crucial pronghorn and mule deer winter ranges.

The decline of sage grouse throughout the west has been of increasing concern (Heath *et al.*, 1996; Heath *et al.*, 1997; Braun, 1998). Reasons for their decline have been attributed to conversion of sagebrush-grasslands to agriculture, herbicide and mechanical treatments to convert sagebrush to pasturelands for livestock, livestock grazing that removes concealing vegetation at nest sites thus exposing them to predation, mining and energy developments, creation of reservoirs that eliminate riparian zones utilized by sage grouse broods, expansion of human settlements into sage grouse habitats, and fragmentation of habitats by fencelines, highways, and powerlines (Heath *et al.*, 1996; Braun, 1998). Also, noise from vehicles on highways has been suggested having an adverse impact on sage grouse lek attendance (Braun, 1998).

Mating displays by male sage grouse involve acoustic signals coupled with visual displays (Eng *et al.*, 1979; Vehrencamp and Bradbury, 1989; Gibson and Bradbury, 1985; Gibson, 1989, 1992, 1996; Gratson, 1993) so that constant noise could interfere with females' attraction to males' displays. Background noise on the PAPA is similar to EPA's "farm in valley" noise category which is about 39 dBA. Noise levels associated with operational activities (cars and pickup trucks) range approximately from 60 to 70 dBA at 100 feet away (Golden *et al.*, 1980). Those vehicles would utilize area roads throughout the year, including the period of lek attendance. If well field access roads were 0.25 mile (1,320 feet) from an active lek, the noise level at the lek would range from about 39 to 49 dBA (based on 6 dBA decrease for every doubling of distance; Golden *et al.*, 1980). That range includes the 10 dBA increase above estimated background noise that would occur throughout the operational phase of the project.

By comparison, heavy trucks, scrapers and dozers produce noise ranging from 80 to 102 dBA at 100 feet. At 0.25 mile those sources would generate at least 59 dBA, comparable to EPA's "noisy urban residential" category. An operating drill rig on the PAPA is likely to produce noise of 39 dBA at 2,000 feet and 34 dBA at 3,000 feet away. A 26,000 hp compressor station, though, is expected to produce noise levels of approximately 38 dBA at 5,000 feet (see Air Quality Technical Report).

BLM has proposed several studies to determine if 0.25-mile buffers around leks are sufficient to mitigate impacts due to noise and other potential impact sources associated with natural gas developments. Once completed, noise impacts to lek attendance and sage grouse reproduction will be better understood.

Although many sage grouse nest within a two-mile radius of a lek, nesting distances can be quite variable. A recent study of nesting sage grouse conducted in the vicinity of Farson revealed nests as close as 0.29 mile (1,510 feet), as far as 12.2 miles, and with half of all nests within 2.2 miles from the lek of capture (Heath *et al.*, 1997).

The WGFD's Mitigation Policy places game birds in the "moderate" mitigation category (sage grouse included) but parturition areas (including sage grouse nesting habitat) are in the "high" category: no net loss of habitat function is recommended (see Table 4-44) although noting that habitat can be reconstructed or enhanced where avoidance is not possible. WGFD is currently reevaluating this policy. Given the specificity of sage grouse nesting requirements that include mature sagebrush, it is unlikely that destroyed nesting habitat can be restored during the life of the project. Opportunities may exist, however, to enhance remaining vegetation and habitat characteristics to provide more suitable habitat than currently exists. If that cannot be accomplished, there would be a net loss of habitat function and impacts to sage grouse nesting habitat would be significant.

In their study of responses by nesting ferruginous hawks to human disturbances, White and Thurow (1985) concluded that 90 percent of all nesting adults would not flush from nests if the disturbance was more than 250 meters (820 feet) away. Based on these findings, BLM adopted the policy avoiding placement of well pads, roads and any other facilities requiring human presence within 825 feet of all raptor species' nests that had been active during one of three years past. The researchers cautioned, though, that the buffer zone should be expanded when prey are scarce, when ferruginous hawks must spend more time searching for prey and appear to be less tolerant of disturbances (White and Thurow, 1985).

Documented effects of highway traffic on nesting birds indicate the greatest effects are in grasslands and less in woodlands (Forman and Alexander, 1998). The effects of highway noise on reducing densities of grassland bird species may extend as far

as 3,000 feet from the road (Forman and Alexander, 1998). Studies proposed by USFWS (Folley and Anderson, 1998) to monitor response of breeding birds in sagebrush-grasslands before and during natural gas developments on the PAPA, if funded, should provide valuable information about impact levels to those species.

Habitat Models. As stated throughout this EIS, it is not possible to predict where development would occur in the project area. Much additional exploratory drilling would be necessary before it is possible to determine locations where economically recoverable gas reserves are located. But for this EIS, habitat models that evaluate habitat suitability for pronghorn winter range, mule deer winter range, and sage grouse nesting habitats (Reeve and Krawczak, 1995) were applied to the PAPA. The models are used here to simulate the various approaches and geographic arrangement of well pads that could be employed to extract natural gas. The models serve as a means to compare effects on three important wildlife habitats within the PAPA.

All of the 3 habitat models evaluate each parcel of ground for being suitable winter habitat or nesting habitat where pronghorn, mule deer or nesting sage grouse probably would occur as opposed to being marginal habitat in which animals may or may not occur, but with less certainty than in suitable habitat. Each model begins with a premise: a) that for wintering pronghorn and mule deer crucial winter ranges are highly suitable habitat, non-crucial winter ranges less so, and ranges used only during non-winter periods have no suitability; b) for nesting sage grouse areas within 2 miles of a lek are highly suitable nesting habitat and areas beyond 2 miles are less suitable.

In each model, the initial premise for habitat suitability on any parcel of ground is modified by effects of various physical, biological, and human-related factors that are present at that spot. Those factors common to the pronghorn and mule deer winter range models include vegetation cover, topography, slope aspect, elevation, overlap with ranges of potential competitors, livestock grazing, distances to human settlements, roads and well pads, and disturbed ground surface. Likewise, initial habitat suitability level for nesting sage grouse are modified by the model with effects of vegetation cover, topography, distance to brood-rearing habitats, distance to available water, livestock grazing, distances to human settlements, roads and well pads,

and disturbed ground surface. Details about model theory and operational relationships of these factors are provided in the Wildlife Technical Report.

The models were used to evaluate existing habitat conditions on the PAPA with livestock grazing, roads, well pads and human settlements as known sources of impact. Because exact locations of well pads and roads cannot be determined for any of the alternatives, each model was used to simulate the effects of different well pad spacing regimes. Since locations of potential well pad sites are known across the PAPA (see Appendix B - Status of Each Potential Well Pad Location in the Project Area) but locations of roads are not, only the spatially explicit effects of well pads were included in simulations. The area chosen for model simulation includes four areas of high geologic interest and high well pad development potential lying over the anticline crest (Figure 4-8). Combined, these four areas amount to 34,243 acres within the PAPA. Model simulations in these areas are used to compare potential effects of the various exploration/development scenarios, project alternatives and options that are discussed below.

Each model employs a "zone of effect" (see Theobald *et al*, 1997) surrounding each well pad. For mule deer and pronghorn models those zones of effects are radii of 0.6 mile around each well pad; for sage grouse nesting habitat the zone of effect is a radius of 0.15 mile (800 feet) around each pad. Models were not designed to differentiate effects of well pads that are closer together than these radii (0.6 mile or 0.15 mile) since zones of effect can overlap under some of the well pad spacing regimes and the models have no provisions to evaluate incremental impacts where zones of effect overlap.

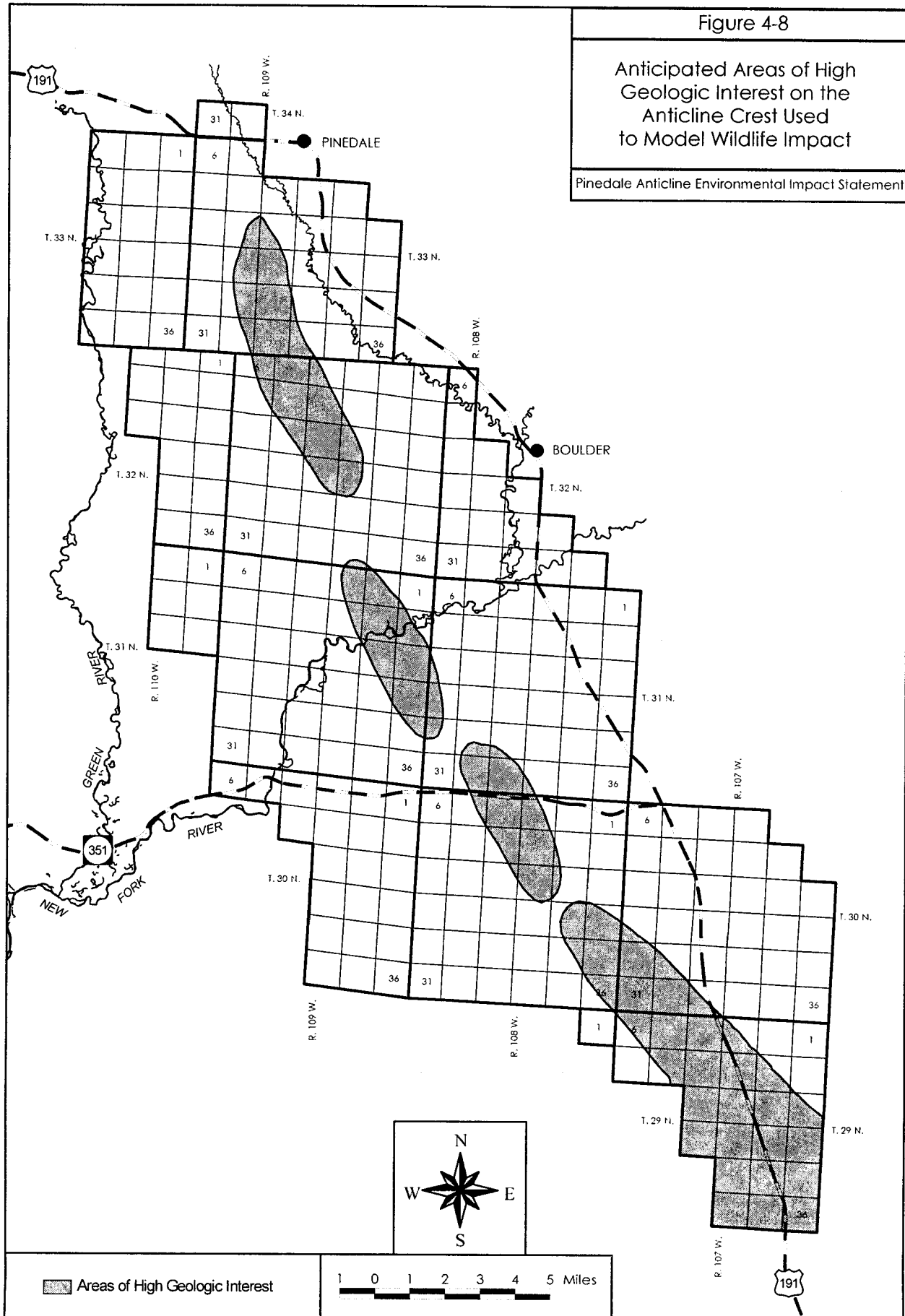
Compression. All of the proposed compressor sites are within 2 miles of a sage grouse lek. Noise produced by a 26,000 hp compressor is expected to attenuate to background levels at approximately 5,000 feet. Consequently, sage grouse nesting habitats within 2 miles from a lek may be affected over the long-term. None of the proposed sites is within 0.25 mile of any raptor nest nor within any white-tailed prairie dog colony.

The proposed Jonah Gas site in Section 3 (T31N, R109W) borders mule deer winter range and is within antelope crucial winter range but not moose crucial winter/yearlong range. Likewise, the Ultra site in Section 16 (T31N, R108W) is within mule deer winter range and is within antelope crucial winter range but

Figure 4-8

Anticipated Areas of High
Geologic Interest on the
Anticline Crest Used
to Model Wildlife Impact

Pinedale Anticline Environmental Impact Statement



not moose crucial winter/yearlong range. Both Western Gas sites and the other Jonah Gas site in Section 36 (T30N, R108W) are not within any big game crucial ranges.

Sales Pipeline. The proposed sales pipeline route passes through crucial winter-yearlong range in the Sublette Antelope Herd Unit at several locations as well as crucial winter-yearlong and severe winter relief ranges in the Carter Lease Antelope Herd Unit. Although no construction would be allowed in these areas between November 15 and April 30, loss of shrub-dominated forage within construction rights-of-way would occur over the long-term even though revegetation with grasses and forbs would provide some forage during seasons other than winter.

In addition, the proposed sales pipeline route passes through mule deer winter-yearlong range in the Steamboat and Wyoming Range Herd Units at several locations. Construction would be allowed in these areas between November 15 and April 30 and, if it occurred then, there would be a potential for mule deer to vacate some area on winter ranges in the vicinity of the project over the short-term. Also, loss of shrub-dominated forage within construction rights-of-way would occur over the long-term even though revegetation with grasses and forbs would provide some forage during seasons other than winter.

The route passes within 2 miles of two known sage grouse leks. Construction of the pipeline could affect nesting habitats, depending on types of vegetation that would be removed. Construction within 2 miles of a lek would be restricted from March 1 through June 30. The proposed route also passes within potential raptor nesting habitats along the Green River although other nesting sites undoubtedly occur along the route. Construction of the pipeline could affect nesting raptors but would mostly be eliminated by avoiding construction within 0.5 to 1.0 mile (depending on species) during the nesting period and avoiding surface disturbance within 825 feet of nests.

Even though the pipeline location will be within a designated corridor, it could contribute to habitat fragmentation but with unknown affects to local populations of nesting birds, small mammals or herpetofauna. Pipeline construction would affect at least seven prairie dog colonies which also provide habitat for various species.

BP Amoco Field Office. The BP Amoco Field Office would disturb 5 acres of sagebrush steppe vegetation over the long-term. It does not coincide with any big game wintering habitat and is beyond 2 miles of the nearest known sage grouse lek. The facility would lie adjacent to the Luman Road which connects the Jonah Field with Highway 191. The site potentially lies in a migration corridor that could be used by pronghorns migrating from northern summer ranges, as far as from Grand Teton National Park. Migrating pronghorns are not expected to be inhibited by the facility's presence as long as there no associated fencing is constructed perpendicular to directions of animal movement. Fences constructed on either side of Luman Road adjacent to the BP Amoco Field Office or elsewhere could significantly impact migrating animals. The field office would be located at an existing migration constriction caused by the Pinedale/Rock Springs Field Area boundary fence.

4.19.3.2 Project Wide Exploration/Development Scenario.

Standard Stipulations Alternative. BLM policy provides standard stipulations that target specific wildlife species and wildlife habitats, providing some level of protection during critical periods of the annual cycle. For other species, there are stipulations in place that protect specific areas that are used seasonally by wildlife. Some standard stipulations restrict surface disturbance activities within wildlife habitats during key periods, but only on Federal lands and minerals. They include:

1. restrict construction activities within crucial antelope winter range during the period from November 15 through April 30;
2. restrict construction activities within mule deer winter range and crucial winter range on the PAPA during the period from November 15 through April 30;
3. restrict construction activities within crucial moose winter/yearlong range during the period from November 15 through April 30;
4. restrict construction activities within 2 miles of active sage grouse leks during the period from March 1 through June 30; and
5. restrict construction activities within 0.5 mile of active raptor nests - within 1 mile of active ferruginous hawk and bald eagle nests - during the period from February 1 through July 31.

These five stipulations would reduce short-term impacts to wildlife on Federal lands and minerals but up to 16 well pads/section could be constructed within the big game crucial winter ranges, sage grouse nesting habitats surrounding leks, and in the areas surrounding raptor nests that are on non-Federal lands and minerals. Once constructed, producing wells could be accessed throughout the year for the life of the project on Federal and non-Federal lands and minerals. The following additional standard stipulations would avoid any surface disturbance activities within specific wildlife habitats but only on Federal lands and minerals:

1. avoid well pads, roads, aboveground structures within 0.25 mile of active sage grouse leks; and
2. avoid well pads within 825 feet of active raptor nests - within 2,000 feet of active bald eagle nests.

Other BLM standard stipulations that limit surface disturbances for other resources on Federal lands and minerals in the PAPA would also provide some protection to habitats used by various other wildlife species. Those standard stipulations are in Table 2-8 and are included in the discussion in Section 4.18.3.2 but not listed here.

Big Game. WGFD (1998) identified big game crucial winter range as a vital resource (Table 4-44) and recommends no loss of habitat function even though some modification of habitat characteristics may occur. The function of crucial winter range is to provide shelter and forage to big game, ensuring their survival during periods of significant winter stress. Crucial habitat, in general, is described as the determining factor in a population's ability to maintain and reproduce itself at a certain level (at least at the WGFD big game herd unit population objective - the 1987 big game population objectives are recognized by BLM for purposes of land use management) over the long-term.

The impacts to big game habitat are described based on short- and long-term disturbance. This EIS recognizes that although a site may be revegetated within 3 to 5 years after disturbance, the shrub component of the native vegetation could be lost for a considerably longer period of time (8 to 15 years). Therefore, even though the habitat loss is described below as short-term, it is recognized that the long-term (5 years or more) loss of the shrub component would result in a significant impact according to the WGFD's Mitigation Policy.

Under the SS Alternative, up to 16 well pads/section could be developed on portions of moose crucial winter/yearlong range, pronghorn crucial winter range and mule deer crucial and noncrucial winter ranges. It is possible that, depending on the level of development, all 500 producing well pads or all 700 producing well pads could occur within pronghorn and mule deer crucial ranges but a maximum of 460 well pads could possibly be located within moose crucial winter/yearlong range (Table 2-6). If 16 well pads/section are allowed to be developed in these habitats (assuming a 23 percent rate for dry hole wells), short-term disturbance of at least 108 acres/square mile could occur due to well pad clearing and road and pipeline construction. Over the long-term, at least 32 acres/square mile would remain disturbed. It is also possible, but unlikely, that no new well pads would be located within any big game crucial ranges.

There are 899 potential well pad locations in pronghorn crucial winter range and 1,018 potential locations in mule deer crucial and non-crucial winter ranges also on Federal lands and minerals (Table 2-6). It is possible that all well pads, whether 500 or 700, could be located in those habitats and, because they would be subject to BLM's standard stipulations, no exploration or drilling activities would affect pronghorn or mule deer during winter. Most potential well pads in moose crucial winter/yearlong range are on non-Federal lands and minerals (Table 2-6) and would not be subject to standard stipulations.

But once drilled and under production, wells would be accessed during winter while big game animals are on their crucial ranges. The encounter rate between workers and big game would be greater for the SS Alternative than under either RP Alternatives where no more than four well pads/section would be allowed within crucial big game winter ranges. Consequently, more wintering pronghorn and mule deer would be expected to expend additional energy and/or avoid more habitat near well pads and roads for this alternative than under alternatives with limits of 4 pads/section: more habitat function of crucial pronghorn and mule deer winter range would be lost under the SS Alternative than either of the RP Alternatives discussed below.

The pronghorn habitat model was used to evaluate existing conditions in the simulation areas with livestock grazing, roads, well pads and human settlements as known sources of impact. Of the

34,243 acres within the simulation areas, there are 3,860 acres of crucial pronghorn winter range. With existing conditions the model identified 2,139 acres (6.2 percent of the simulation area, 55.4 percent of the total pronghorn winter habitat) that would be suitable pronghorn winter habitat with moderate to high probability. If 16 well pads/section were developed (40-acre spacing) as could occur under the SS Alternative, the amount of suitable pronghorn winter habitat would only be 1,865 acres (5.4 percent of the simulation area, 48.3 percent of the winter habitat). That simulation does not include any effects of roads on habitat suitability which are expected to further decrease habitat suitability.

The pronghorn winter habitat model has not been validated in the field. But, studies are being conducted by the University of Wyoming (Smith *et al.*, 1996; Sawyer and Lindzey, 1999a) and funded in part by Ultra that will provide data on wintering pronghorn habitat use. That data will be used to validate or revise the existing model.

Likewise, the mule deer winter habitat model was used to simulate the effects of different well pad spacing scenarios within the simulation area lying over the anticline crest (Figure 4- 8) on which there are 9,497 acres of mule deer winter and crucial winter ranges. Under existing conditions the model predicted that 3,972 acres (11.6 percent of the simulation area, 41.8 percent of the mule deer winter habitat) would be suitable winter habitat with moderate to high levels of certainty. If 16 well pads/section were developed (40-acre spacing) in these areas, the amount of suitable mule deer winter habitat likely to remain would only be 2,637 acres (7.7 percent of the simulation area, 27.8 percent of the winter habitat). That simulation does not include any effects of roads on habitat suitability. The mule deer winter habitat model used here is currently being evaluated in the field by the University of Wyoming (Wyoming Cooperative Wildlife Research Unit, 1996; Sawyer and Lindzey, 1999b) and funded in part by Ultra. The results of that research will be used to validate or revise the existing model.

Sage Grouse. The WGFD's Mitigation Policy places game birds in the "moderate" mitigation category (sage grouse included) but parturition areas (including sage grouse nesting habitat) are in the "high" category: no net loss of habitat function is recommended (see Table 4-44) although WGFD notes that habitat can be reconstructed or enhanced where avoidance is not possible. Given the specificity

of sage grouse nesting requirements that include mature sagebrush, it is unlikely that destroyed nesting habitat can be restored during the life of the project. Opportunities may exist, however, to enhance remaining vegetation and habitat characteristics to provide more suitable habitat than currently exists. If that cannot be accomplished, there would be a net loss of habitat function and impacts to sage grouse nesting habitat would be significant.

There are 44 sage grouse leks within the project area. Standard stipulations would avoid any surface activities or above ground structures within 0.25 mile of each lek on Federal lands and minerals and that would protect 40 leks. There are 4 known leks not subject to that stipulation on non-Federal lands and minerals and 11 potential well pads could be located within 0.25 mile of those leks. BLM stipulations also would avoid surface disturbing activities within 2 miles of each lek between March 1 and June 30 to avoid disturbing sage grouse courtship displays on leks and grouse nesting within that 2 mile radius.

Once lek attendance and nesting periods end, roads and wells may be located anywhere in a 2-mile radius but not within 0.25 mile of a lek. Consequently, there are 141,595 acres in the PAPA that fall outside of 0.25 mile buffer but within 2 miles of a lek and within which there are 3,319 potential well pad locations. So, whether 500 or 700 well pads are developed under this alternative, there is a chance that all could be within 2 miles of a sage grouse lek. Once wells are operational, maintenance activities would occur during the lek attendance and nesting periods. With the importance of males' auditory signals that attract females to breed at leks (see Table 4-45), the potential impact exists that noise associated with maintenance activities could interfere with mating and reproduction (Braun, 1998).

BLM (1998b) has proposed several studies to determine if 0.25-mile buffers around leks are sufficient to mitigate impacts due to noise, aboveground structures that may serve as perches for raptors (as predators of sage grouse), and due to human presence and activities. Once those studies are conducted, impacts by natural gas developments on lek attendance and sage grouse reproduction will be understood better than they are now. The ongoing sage grouse study on the Mesa started by Ultra Petroleum may very likely be extended as part of the 0.25 mile study area being considered presently.

Although many sage grouse nest within a 2-mile radius of a lek, nesting distances can be quite variable. A recent study of nesting sage grouse conducted in the vicinity of Farson revealed nests as close as 0.29 mile (1,510 feet), as far as 12.2 miles, and with half of all nests within 2.2 miles from the lek of capture (Heath *et al.*, 1997). If sage grouse nest similar distances from leks within the PAPA, then the exclusion of construction within two miles of a lek during the period from March 1 to June 30 might protect fewer than 50 percent of all nesting sage grouse mating at leks within the PAPA.

The sage grouse nesting habitat model was used to simulate the effects of different well pad spacing scenarios within the 34,243-acre simulation area lying over the anticline crest (see Figure 4-8) within which there are 29,534 acres that could possibly be used by nesting sage grouse. The model predicted that 25,588 acres (75 percent of the simulation area; 86.6 percent of the potential nesting area) would be suitable nesting habitat with existing environmental conditions. If 16 well pads/section were developed (40-acre spacing) that would be possible under this alternative, the amount of suitable sage grouse nesting evaluated with moderate to high certainty would only be 14,014 acres (40.9 percent of the simulation area; 47.5 percent of the potential habitat). That simulation does not include any effects of roads on habitat suitability.

Since spring 1998, sage grouse nesting habitat has been evaluated in the PAPA and vicinity by researchers with the University of Wyoming (Wyoming Cooperative Wildlife Research Unit, 1997) and funded in part by Ultra. The results of that research will be used to validate or revise the existing model.

Raptor Nests. The WGFD's Mitigation Policy places Wyoming native species of special concern with Status 3 (SSC 3 in Table 3-32) in the "high" mitigation category and SSC 4 species in the "moderate" mitigation category (see Table 4-44). Ferruginous hawks and possibly merlins nesting on the PAPA and peregrine falcons migrating through the area are SSC3 species while burrowing owls are SSC4 species. Other raptors known to nest on the PAPA, including osprey, golden eagle, red-tailed hawk, Swainson's hawk, prairie falcon, American kestrel and great horned owl are classified as SSC 5, 6 or 7 species and are in the "low" mitigation category.

There are 69 known raptor nests within the PAPA. BLM standard stipulations avoid placement of well pads, roads and any other facilities requiring human presence within 825 feet of all nests on Federal lands and minerals that have been active during one of the past three years. Thirty-eight of the nests would be protected by this stipulation but 31 nests located on non-Federal lands and minerals would not and there are 44 potential well pad locations within 0.25 mile of those 31 nests. All of those locations could be developed, whether 500 or 700 well pads occurred on the project area. Short-term impacts due to these 44 well pads alone would amount to 162.8 acres of disturbance within the 0.25 mile zone around those 31 nests.

BLM would also restrict construction activities within 0.5 mile of active or occupied raptor nests (1 mile of active ferruginous hawks and bald eagle nests) during the period from February 1 through July 31. By avoiding construction during nesting potentially from February 1 through July 31 within one mile of occupied ferruginous hawk and bald eagle nests and within 0.5 mile of nests occupied by other species, construction-related impacts would be reduced or eliminated. Whether eliminating wells, roads or other facilities from within 825 feet of a potentially occupied nest, particularly ferruginous hawk nests, will provide sufficient protection to nests from maintenance operations is unknown but evidence suggests the restriction may prevent nest abandonment, at least during years of high prey availability. There are 271 potential well pad locations in wetlands on private and state-owned land that, if constructed, could affect raptors that forage primarily in wetlands. In addition, impacts to nest structures could occur on these lands because BLM cannot restrict development in the vicinity of nest sites on private lands. Therefore, it is anticipated that a significant impact to nesting raptors could occur on non-Federal lands and minerals under the SS Alternative.

Other Terrestrial Wildlife. The only certain impact to other terrestrial wildlife by construction and operation of this alternative is loss of vegetation and habitats. With 47.6 percent of the PAPA covered by high density sagebrush and an additional 26.7 percent covered by low density sagebrush, passerine birds that are obligate shrub-steppe nesting species would be most affected. Loss of shrubs and fragmentation of shrub-dominated habitats would be short- and long-term impacts to these birds and possibly to some small mammal species as well.

Studies proposed by USFWS (Folley and Anderson, 1998) to monitor response of breeding birds in sagebrush-grasslands before and during natural gas developments on the PAPA, if funded, should provide valuable information about impact levels to those species. No species classified as SSC 1, 2, or 3 by WGFD are obligate shrub-steppe nesters.

There are approximately 5,803 acres of white-tailed prairie dog colonies within the PAPA. Under the SS Alternative 3,787 acres of prairie dog colonies could be developed for up to 16 well pads/section (see Section 4.18.3.2 for a detailed analysis of potential project effects to prairie dog colonies). Whether all burrows are active or not, burrows may still provide shelter to other wildlife species. Construction activities that compress or eliminate burrows would adversely affect the inhabitants. No species classified as SSC 1, 2, or 3 by WGFD are likely to inhabit white-tailed prairie dog burrows.

Aquatic Resources. The New Fork River, from the confluence with Pine Creek to the East Fork River downstream, is a Class 2 stream with "high" rating by WGFD's Mitigation Policy. The Green River is likewise a Class 2 stream between Fontenelle Reservoir and the New Fork River. Consequently, no net loss of habitat function is recommended. Any degradation to water quality by erosion, siltation and/or discharge of toxic compounds would be a significant impact to the streams and fisheries (see Reid, 1993 for a recent comprehensive review). While there would be no well pads located within 100 feet of intermittent streams, 500 feet of wetlands and perennial streams or within 100-year flood plains on Federal lands and minerals, there are 514 potential well locations on non-Federal lands and minerals that could be developed within the 500 foot buffer. In addition, 271 well pad locations could be developed within wetlands and/or 232 pad locations could be constructed within 100-year flood plains that occur on state or private lands. If any or all of these well sites are developed, the potential for significant impacts to streams and fisheries would exist from sedimentation impacts and other potential sources of water quality degradation (i.e., spills, loss of streambank vegetation and scrub-shrub and/or forested wetlands).

RP Alternative on Federal Lands and Minerals.

Management objectives for sensitive wildlife habitats would include all of those spatial and temporal restrictions listed above for the SS Alternative. However, there are additional resource protection measures that would be applied to wildlife habitats on

Federal lands and minerals. None of these would be placed on non-Federal lands and minerals. Resource protection measures that in addition to standard stipulations would avoid well pads in specified areas:

1. avoid well pads with the Mesa Breaks Management Area (Figure 4-9);
2. avoid placement of well pads, roads and any other facilities requiring human presence within 1,000 feet of all ferruginous hawk nests that have been active during one of the past three years.

Additionally, the following areas that coincide with Federal lands and minerals ownership would be subject to limitations on well pad densities:

3. well pad densities limited to 4 pads/section within Antelope Crucial Winter Range;
4. well pad densities limited to 4 pads/section with Mule Deer Winter and Crucial Winter Ranges;
5. well pad densities limited to 4 pads/section within Moose Crucial Winter/Yearlong Range;
6. well pad densities limited to 4 pads/section within high quality Sage Grouse Nesting Habitat;
7. well pad densities limited to 8 pads/section within lower quality Sage Grouse Nesting Habitat.

Finally, the following measures would regulate the amount of disturbances within key wildlife habitats on Federal lands and minerals:

8. allow no more than 5 drilling rigs operating on the PAPA, only 2 of which would be allowed to work on new locations at any one time north of the New Fork River; and
9. noise from project activities would be managed near leks while they are actively attended during hours from midnight to 9 a.m. so that no more than a 10 dBA increase in background noise occurs at the lek.

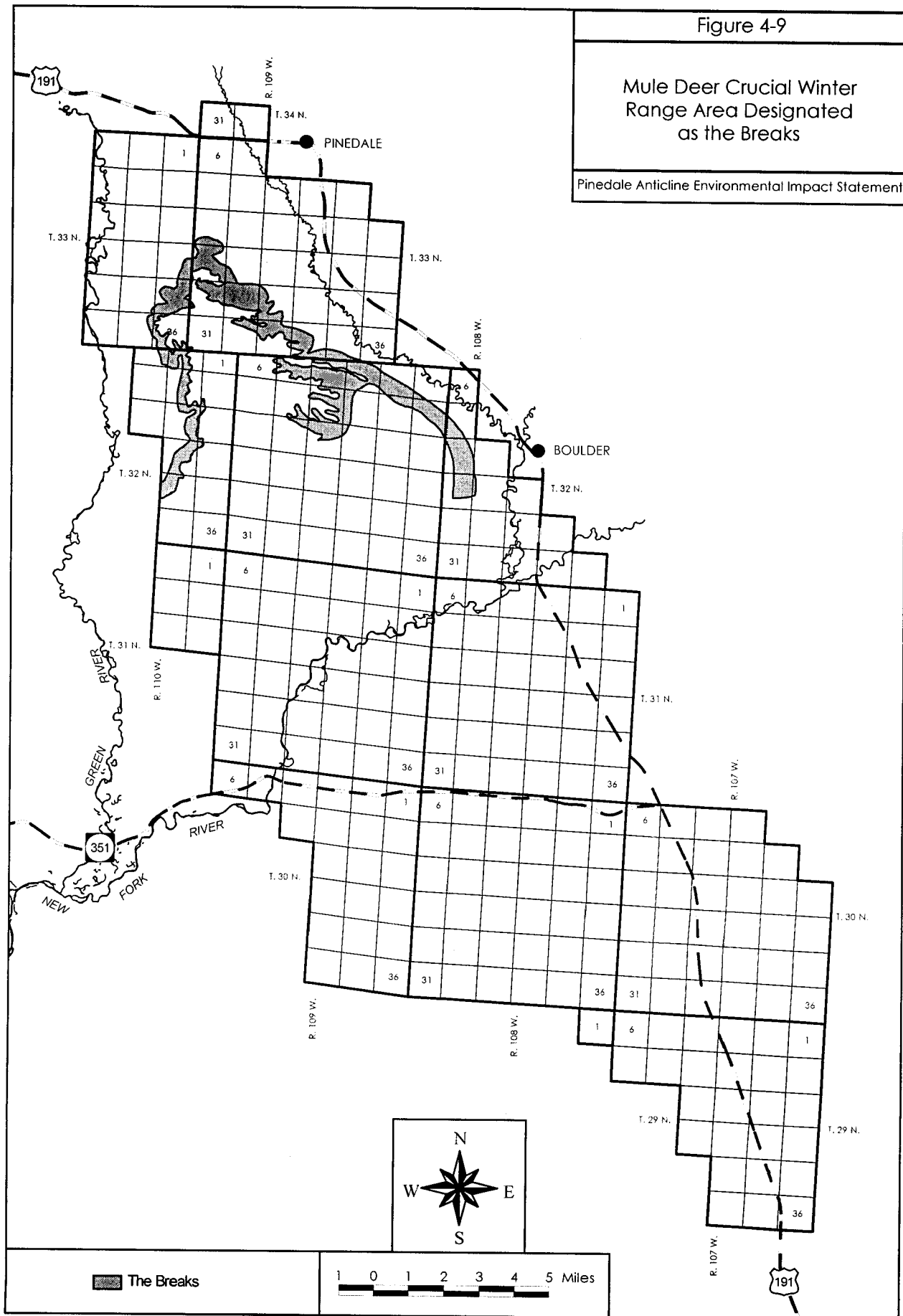
There are other resource protection measures that protect other resources by a) restricting or avoiding well pad placement in specific areas, and b) limiting well pad densities in specific areas would also provide protection and limit well pad drilling in wildlife habitats used by other wildlife species. Those protection measures are in Table 2-8 and included in the discussion in Section 4.18.3.2.

Big Game. With this RP Alternative, there would be no more than four well pads/section in any of the big game crucial winter ranges on Federal lands and minerals. There are 41,071 acres of pronghorn

Figure 4-9

Mule Deer Crucial Winter
Range Area Designated
as the Breaks

Pinedale Anticline Environmental Impact Statement



crucial winter range on the PAPA that would be subject to this limitation. Potentially, 225 well pads spaced on every 160 acres could be constructed in pronghorn crucial winter range. There are 161 potential well pad locations within pronghorn crucial range on non-Federal lands and minerals that could be developed at densities of 16 pads/section, whether at the 500 or 700 well pad development level. But as noted under the SS Alternative, there might be no well pads within pronghorn crucial winter range.

Similarly, 44,601 acres of mule deer winter and crucial winter ranges on which well pads that would be limited to 4 pads/section so that 255 pads might be constructed at that density. And, 5,624 acres of moose crucial winter/yearlong habitat would also be limited to 4 well pads/section allowing for up to 23 pads in that habitat subject to the limitation. Conceivably, 370 additional well pads placed on every 40 acres could be constructed within the remainder of moose crucial range on non-Federal lands and minerals, whether levels of 500 or 700 well pads are developed. Likewise, well pad densities could reach 16 pads/section within 8,749 acres of mule deer winter habitats on non-Federal lands and minerals so that 222 potential well pad locations within the remaining mule deer winter habitat on the PAPA could be at that density.

The area described as the Mesa "Breaks" is shown in Figure 4-9. It includes approximately 7,497 acres of which 7,243 is Federal lands or minerals. By implementing the restriction in the Breaks, BLM would require that 168 potential well pad locations be directionally drilled from surface locations outside the breaks to bottomholes under the Breaks if natural gas reserves were to be accessed beneath that area. At its widest point, the Breaks is 3,500 feet across. However, under this alternative 6 potential well pad sites could still be developed on non-Federal lands and minerals in the Breaks at a spacing of up to 16 well pads/section.

During well field operations, the encounter rate between workers and mule deer would be greater for the SS Alternative than under either of the RP alternatives where no more than four well pads/section would be allowed. Consequently, more wintering mule deer would be expected to expend additional energy and/or avoid more habitat near well pads and roads for the SS Alternative than under alternatives with limits of four pads/section: more habitat function of crucial mule deer winter range

would be lost under the SS Alternative than either of the RP alternatives.

The pronghorn winter habitat model, described above, was used to simulate the effects of 160-acre spacing, 4 well pads/section to compare with modeled effects of 16 well pads/section. During the simulation, the same well pad densities were applied to all land within the four areas on the anticline crest (see Figure 4-8), not just Federal lands and minerals. Even though the model was not designed to discriminate effects of roads or well pads closer together than 0.6 mile, well pads spaced at 160-acre intervals within the simulation area would result in only 1,986 acres (5.8 percent of the simulation area; 51.5 percent of pronghorn crucial range) to be suitable pronghorn winter habitat compared to 1,865 acres (5.4 percent of the simulation area; 48.3 percent of crucial range) that could occur for the SS Alternative.

The mule deer winter habitat model was also used to simulate the effects of 160-acre spacing within the 34,243-acre simulation area on the anticline crest. Well pads spaced at 160-acre intervals within the simulation area would result in only 2,858 acres (8.3 percent of the simulation area; 30.1 percent of mule deer winter range) to be suitable mule deer winter habitat compared to 2,637 acres (7.7 percent of the simulation area; 27.8 percent of deer winter ranges) under the SS Alternative.

In short, the modeled impacts to pronghorn and mule deer winter ranges discussed under the SS Alternative would be nearly identical for the RP Alternative for Federal lands and minerals except overall local densities of well pads, roads and gathering pipelines would be lower (except on state and private lands). Even so, implementation of the RP Alternative on Federal Lands and Minerals is still expected to produce a significant impact to pronghorn crucial winter range for the same reasons as noted for the SS Alternative but overall impact levels would be decidedly less.

The resource protection measure limiting the number of drilling rigs present on the PAPA to 5 and further limiting just 2 rigs operating north of the New Fork River (on Federal lands and minerals) would reduce the presence of that disturbance during winter since much of the pronghorn and mule deer winter and crucial winter ranges are north of the river (see Figures 3-19 and 3-20). However, moose crucial winter/yearlong range is mostly on private lands that lie on both sides of the New Fork River so that

resource protection measure would have limited applicability to wintering moose.

Sage Grouse. Background noise on the PAPA is similar to EPA's "farm in valley" noise category which is about 39 dBA. BLM standard stipulations currently require roads to be at least 0.25 mile from leks and well-field vehicles travel those roads to conduct maintenance activities once wells are productive. Noise at leks due to those vehicles is estimated to be 49 dBA, 10 dBA above estimated background noise that would occur throughout the operational phase of the project.

Controlling noise levels to 10 dBA above ambient levels during the lek attendance period at all sage grouse leks on Federal lands and minerals would likely produce less impact to the 40 sage grouse leks on those lands. There are only 4 leks on non-Federal lands and minerals that would not be subject to this constraint. The RP Alternative provides more protection and less impact to leks than the SS Alternative. BLM has proposed several studies to determine if 0.25-mile buffers around leks are sufficient to mitigate impacts due to noise and other potential impact sources associated with natural gas developments. Once completed, noise impacts to lek attendance and sage grouse reproduction will be better understood.

Similar to comparative analysis for mule deer and pronghorn crucial winter ranges, the RP Alternative on Federal Lands and Minerals potentially limits the impacts described to sage grouse nesting habitat compared to the SS Alternative. The principal reason lies in the limitation of no more than 4 well pads/section within 2 miles of any sage grouse lek (potential nesting habitat for approximately 50 percent of all sage grouse nesting on the PAPA) and within high quality nesting habitat predicted by the model designed to evaluate nesting habitat. Even so, there are 485 potential well pad sites within a 2-mile radius of leks on non-Federal lands and minerals that could be developed up to 16 well pads/section. With that possibility, impacts to sage grouse nesting habitat would probably be significant for the same reasons reported for the SS Alternative.

The sage grouse nesting habitat model, using existing habitat conditions, defined areas on the PAPA that were highly likely to be suitable as nesting habitat (with levels of certainty from 80 to 100 percent). These areas, primarily south of Highway 351, are those in which 4 well pads/section would be

managed under this alternative. Preliminary data analysis shows 76 percent of radio-collared female sage grouse nested in areas that the model predicted as suitable nesting habitat with probability levels between 80 and 100 percent.

Using the sage grouse nesting habitat model to simulate effects of well pad spacing, 4 well pads/section within the simulation area would result in 19,999 acres (58.4 percent of the simulation area; 67.7 percent of possible nesting areas) to be suitable nesting habitat compared to 14,014 acres (40.9 percent of the simulation area; 47.5 percent of possible nesting areas) under densities of 16 well pads/section with the SS Alternative. That is, the impacts to sage grouse nesting habitats predicted by the model simulating effects of the SS Alternative would be considerably less under the RP Alternative on Federal Lands and Minerals.

Raptor Nests. BLM's standard stipulations restrict construction activities within 0.5 mile of active or occupied raptor nests (1 mile of active ferruginous hawk and bald eagle nests) during period from February 1 through July 31 and avoid placement of well pads, roads and any other facilities requiring human presence within 825 feet of all nests that have been active during one of the past three years (within 2,000 feet of bald eagle nests). This alternative would also avoid placement of well pads, roads and any other facilities requiring human presence within 1,000 feet of all ferruginous hawk nests that have been active during one of the past three years and require annual surveys for nesting raptors and adopt protective measures for occupied nests. No restrictions would be applied to non-Federal lands and minerals.

The RP Alternative would diminish the likelihood of significant impacts that could occur under the SS Alternative by increasing the surface occupancy restriction from 825 feet to 1,000 feet around ferruginous hawk nests. The effectiveness of this measure is not known but surely would improve the chance of nesting success for the species. However, the potential for significant impacts to other nesting raptors on non-Federal lands and minerals would remain under this alternative since there are at least 31 nests located on non-federal lands for which there would be no resource protection measures applied.

Other Terrestrial Wildlife. Similar to discussions of impacts to habitats potentially used by listed threatened and endangered species (bald eagles,

black-footed ferrets) and proposed species (mountain plovers) in Section 4.18.3.2 - RP Alternative on Federal Lands and Minerals - there are resource protection measures that protect other resources and would provide some levels of protection to wildlife habitats that, otherwise have no protection *per se*. As an example, the 5,803 acres of prairie dog colonies on the PAPA have no specific protections but standard stipulations and resource protection measures for other resources would avoid well pads on 2,016 acres and would limit well pad densities to 4 pads/section on 3,787 acres so that no area on prairie dog colonies would be subject to 16 well pads/section in this alternative (see Section 4.18.3.2 for a more detailed analysis). Consequently, the RP Alternative is expected to generate fewer impacts to wildlife and habitats project wide than the SS Alternative.

Aquatic Resources. This alternative would not reduce the potential for significant impacts discussed above for the SS Alternatives because no restrictions would be applied to development on non-Federal lands and minerals. There are 514 potential well locations on non-Federal lands and minerals that could be developed within the 500 foot buffer surrounding wetlands. In addition, 271 well pad locations could be developed within wetlands and/or 232 pad locations could be constructed within 100-year flood plains that occur on state or private lands with no Federal minerals ownership.

Pad Drilling. Pad drilling could be implemented on 41,071 acres of pronghorn crucial winter range, 44,601 acres of mule deer winter and crucial winter range, 5,624 acres of moose crucial winter/yearlong range, and 122,553 acres lying between 0.25 mile and 2 miles of sage grouse leks that, because of resource protection measures, would be limited to development of 4 well pads/section. The remaining areas of these wildlife habitats on non-Federal lands and minerals in the PAPA could be maximally developed to 16 well pads/section, drilled using conventional procedures.

If this approach is used, expected short-term disturbance to each wildlife habitat affected would probably be larger than under the RP Alternative since surface disturbances would amount to 5 acres/well pad for multiple well pads as opposed to 3.7 acres/well pad for single well pads. Likewise, long-term impacts would be greater since each multiple well pad would be reclaimed to 2.5 acres while single well pads would be reclaimed so that 1.5

acres would be disturbed. Consequently, slightly more surface disturbance would occur with this option because of the larger surface area required for each multiple well pad than would occur under the RP Alternative.

Applications of the 3 habitat models to the pad drilling option would yield results very similar to those discussed above, for the RP Alternative. However, because of the larger area taken up by each multiple well pad, the amount of each habitat that would be completely unsuitable to wintering pronghorn, mule deer and nesting sage grouse would be larger than under the RP Alternative.

If impacts of multiple well pads are compared to single well pad development, the area of short- and long-term disturbance would increase for the same number of well pads constructed but decrease for the same number of wells drilled. Pad drilling, however, would concentrate human activities more than single well pads for the same number of producing wells. Clumped disturbance would, in general, produce less impact to wildlife habitats than dispersed disturbance (Theobald *et al.*, 1997).

Centralized Production Facilities. Development of centralized production facilities (CPF) in any of the big game wintering and sage grouse nesting habitats discussed above has the potential to increase short-term impacts: up to 16 well pads/section could be developed on any area on which stipulations and/or resource protection measures fully avoid surface disturbances. Each centralized production facility would disturb 5 acres over the short- and long-term. However, each of the well pads developed under this plan could be reclaimed to where only 0.5 acre would remain disturbed over the long-term. And, human presence at each of the well pads would be reduced or nearly eliminated over the long-term.

The potential effects by the CPF option to pronghorn and mule deer winter habitat and sage grouse nesting habitat were evaluated with the models first with one, then with two Centralized production facilities per square mile. In each case, densities of 16 well pads/section were assumed each disturbing 3.7 acres. But, so-called "zones of effect" only occurred around the one or two Centralized production facilities and not around the other 15 or 14 well pads on each section of the simulation area on the anticline crest. If one CPF would be developed, the pronghorn winter habitat model evaluated 1,875 acres within the simulation area as being suitable

pronghorn winter habitat (5.5 percent of the simulation area; 48.6 percent of pronghorn crucial range). With 2 Centralized production facilities, 1,865 acres would be suitable winter habitat (5.4 percent of the simulation area; 48.3 percent of pronghorn crucial range). For comparison, a well pad density of 4 pads/section within the simulation area resulted in 1,986 acres (5.8 percent of the simulation area; 51.5 percent of pronghorn crucial range) to be suitable pronghorn winter habitat compared to 1,865 acres with 16 well pads/section (5.4 percent of the simulation area; 48.3 percent of crucial range) that could occur for the SS Alternative. Since the small simulation area intersected by pronghorn crucial winter range is rated as relatively poor habitat under existing conditions, any development under any alternative options produce little additional degradation to that habitat in the simulation area.

The mule deer winter habitat model was also used to evaluate the effect of one and two Centralized production facilities per square mile. With one CPF, the mule deer winter habitat model evaluated 3,567 acres within the simulation area as being suitable mule deer winter habitat (10.4 percent of the simulation area; 37.6 percent of deer winter range). With 2 Centralized production facilities, 3,528 acres would be suitable winter habitat (10.3 percent of the simulation area; 37.1 percent of deer winter crucial range). For comparison, a well pad density of 4 pads/section within the simulation area result in 2,858 acres (8.3 percent of the simulation area; 30.1 percent of mule deer winter range) to be suitable mule deer winter habitat compared to 2,637 acres (7.7 percent of the simulation area; 27.8 percent of deer winter ranges) under the SS Alternative.

Likewise, the sage grouse nesting habitat model with one CPF per square mile evaluated 22,164 acres within the simulation area as being suitable nesting habitat (64.7 percent of the simulation area; 75.0 percent of nesting area). With 2 Centralized production facilities, 20,955 acres would be suitable nesting habitat (61.2 percent of the simulation area; 70.9 percent of nest area). For comparison, a well pad density of 4 pads/section within the simulation area result in 19,999 acres (58.4 percent of the simulation area; 67.7 percent of possible nesting area) to be suitable nesting habitat compared to 14,014 acres (40.9 percent of the simulation area; 47.5 percent of possible nesting areas) under 16 pads/section. But in each case, long-term disturbances in these habitats would be considerably reduced due to the amount of disturbed surfaces that

could be reclaimed to the greatly reduced human presence at all well pads in a section except at Centralized production facilities.

RP Alternative on All Lands and Minerals.

Management objectives would include all of those spatial and temporal restrictions listed above for the SS Alternative and RP Alternative for Federal Lands and Minerals. However, all management objectives would be applied to all lands within the PAPA, including state and private lands and minerals in the project area under this alternative. The habitat model results simulating developments within pronghorn and mule deer winter habitats and sage grouse nesting habitats for the RP Alternative on Federal Lands and Minerals, above, also apply to this RP Alternative since effects of well pad densities on Federal and non-Federal lands were not distinguished.

Big Game. With this alternative, there would be no more than 4 well pads/section in pronghorn crucial winter range on all lands within the entire PAPA. However, the impacts to crucial pronghorn winter range discussed under the RP Alternative for Federal Lands and Minerals would be nearly identical for this alternative except overall local densities of well pads, roads and gathering pipelines would be lower. All 47,426 acres of pronghorn crucial winter range on the PAPA would be subject to this limitation. Potentially, 265 well pads spaced apart on every 160 acres could be constructed in pronghorn crucial winter range. The remaining wells pads, 235 if the development level is 500 well pads and 435 well pads if 700 pads are to be implemented, would have to be on areas outside of pronghorn crucial winter range and could be developed at densities of 16 well pads/section if those areas do not coincide with other resource protection zones that limit well pad densities.

There are 53,350 acres of mule deer winter and crucial winter ranges on which well pads would be limited to 4 pads/section so that 310 pads might be constructed at that density. And, 20,073 acres of moose crucial winter/yearlong habitat would also be limited to 4 well pads/section allowing for up to 115 pads in that habitat subject to the limitation. If maximum development occurs on either big game range, the balance of well pads would be located out of that range whether levels of 500 or 700 well pads are developed. Even with limiting development density to no more than 4 well pads/section throughout these big game crucial ranges, significant impacts to wintering animals would still be expected.

To protect a specific area of mule deer winter habitat, no well pads or roads would be allowed in the Mesa "Breaks", 97 percent of which is on Federal land. Bottomholes under the breaks would be required to be directionally drilled from outside the breaks. Significant impacts are still anticipated to occur to wintering mule deer with no more than 4 well pads/section and restricting development in the breaks, although impacts would be less because of limitation placed on development on non-Federal lands and minerals.

The resource protection measure limiting the number of drilling rigs on the PAPA to 5 present at any one time and with just 2 rigs operating north of the New Fork River on all lands would reduce the presence of that disturbance during winter since much of the pronghorn and mule deer winter and crucial winter ranges are north of the river. Since 72 percent of all moose crucial winter/yearlong range is on private lands on both sides of the New Fork River, that resource protection measure applied to all lands would provide more benefit to moose as well as other species than the RP Alternative on Federal Lands and Minerals.

Sage Grouse. Impacts to sage grouse leks would probably be slightly less than those described for the RP Alternative on Federal Lands and Minerals since the three leks on non-Federal lands and minerals would be subject the noise limitations. Since there are only 4 leks on non-Federal lands and minerals, the application of this RP Alternative on all lands to regulate noise levels at leks provides more protection and less impact to those leks than either the RP Alternative on Federal Lands and Minerals or the SS Alternative.

This alternative potentially limits the impacts described to sage grouse nesting habitat compared to the two previous alternatives. The principal reason lies in the limitation of no more than four well pads/section within two miles of any sage grouse lek whether on Federal, state or private lands. The limitation of 4 well pads/section would extend throughout high quality sage grouse nesting habitat, predicted by the sage grouse nesting habitat model (with between 80 and 100 percent certainty that the habitat is suitable) but up to 8 well pads/section would be allowed on lower quality habitat, regardless of land or minerals ownership. Nevertheless, the analysis described for the SS Alternative also applies here: the level of impact would still be expected to lead to a net

loss of habitat function for nesting sage grouse that may or may not be replaceable.

Raptor Nests. This alternative would eliminate some potential significant impacts to raptor nests located on non-Federal lands and minerals in the project area, particularly to ferruginous hawk nests on non-Federal land.

Other Terrestrial Vertebrates. Impacts to other terrestrial vertebrates would be similar to those discussed under the SS Alternative. But, local well pad densities would be reduced in upland habitats due to constraints associated with mule deer and pronghorn crucial winter ranges and sage grouse nesting habitats and application of those constraints on non-Federal lands and minerals. Also, resource protection measures that protect other resources would provide some levels of protection to wildlife habitats that, otherwise have no protection *per se* (see the discussion in Section 4.18.3.2 and for effects to prairie dog colonies, above). Consequently, the RP Alternative for All Lands and Minerals is expected to generate fewer impacts to wildlife and habitats project wide than the RP Alternative on Federal Lands and Minerals and SS Alternative. Potential impacts to wetland habitats would be significantly reduced by this alternative because well pads would not be developed within 500 feet of wetlands, riparian areas, or perennial streams nor would they be located within the 100-year flood plain.

Aquatic Resources. Impacts to fisheries would be significantly reduced with this RP Alternative because well pads would not be developed within 500 feet of any wetlands, riparian areas, or perennial streams nor would they be located within the 100-year flood plain.

Pad Drilling. Pad drilling could be implemented on all 47,426 acres of pronghorn crucial winter range, 53,350 acres of mule deer winter and crucial winter range, 20,073 acres of moose crucial winter/yearlong range, and 141,597 acres between 0.25 mile and 2-miles of sage grouse leks that, because of resource protection measures, would be limited to development of 4 well pads/section. If this approach is used, expected short-term disturbance to each wildlife habitat affected would be larger than under the RP Alternative since surface disturbances would amount to 5 acres/well pad for multiple well pads as opposed to 3.7 acres/well pad for single well pads. Likewise, long-term impacts would be greater since each multiple well pad would be reclaimed to 2.5 acres while single well pads would be reclaimed so that 1.5

acres would be disturbed. Consequently, more surface disturbance would occur with this option because of the larger surface area required for each multiple well pad than would occur under the RP Alternative.

If impacts of multiple well pads are compared to single well pad development, the area of short- and long-term disturbance will increase for the same number of well pads constructed but decrease for the same number of wells drilled. Pad drilling, however, would concentrate human activities more than single well pads for the same number of producing wells. Clumped disturbance will, in general, produce less impact to wildlife habitats than dispersed disturbance. However, 4 wells could be drilled on each pad so that all project-related disturbance could occur within just pronghorn crucial winter range or just within mule deer winter and crucial winter range whether 500 or 700 wells were drilled under this option. Because only 115 well pads could be located in moose crucial winter/yearlong range, 460 wells could be drilled there with the balance of development to reach 500 or 700 wells occurring somewhere else. And, all multiwell pad development could occur within 2 miles of sage grouse leks on the project area.

Centralized Production Facilities. Development of Centralized production facilities in any of the big game wintering and sage grouse nesting habitats discussed above has the potential to increase short-term impacts: up to 16 well pads/section could be developed on any area on which stipulations and/or resource protection measures fully avoid surface disturbances. Each centralized production facility would disturb 5 acres over the short- and long-term. However, each of the well pads developed under this plan could be reclaimed to where only 0.5 acre would remain disturbed over the long-term. And, human presence at each of the well pads would be reduced or nearly eliminated over the long-term at all well pad locations except for the 1 or 2 Centralized production facilities in each section.

4.19.3.3 Anticline Crest Exploration/Development Scenario. Clustered or clumped developments reduce impacts on wildlife habitats from habitat degradation ("zones of effect" surrounding a disturbance source) and landscape fragmentation compared to dispersed patterns of development. Consequently, all of the following alternatives and alternative options restricted to the anticline crest (with the exception of 3 hot spots located off of the anticline crest) are likely to produce

overall less impact to wildlife habitats than those considered above (Section 4.19.3.2), under the Project Wide Exploration/Development Scenario.

The habitat model results simulating developments within pronghorn and mule deer winter habitats and sage grouse nesting habitats for the SS Alternative and RP Alternative for the Project Wide Scenario, above, also apply to this Anticline Crest Scenario since the simulation area was entirely within the anticline crest. Results of those modeling efforts are not duplicated here.

Standard Stipulations Alternative. BLM policy provides standard stipulations that target specific wildlife species and wildlife habitats, providing some level of protection during critical periods of the annual cycle. The same stipulations discussed in Section 4.19.3.2 apply here. And as noted there, other BLM standard stipulations that limit surface disturbances for other resources on Federal lands and minerals in the PAPA would also provide some protection to habitats used by various other wildlife species on the anticline crest. Those standard stipulations are in Table 2-8 and included in the discussion in Section 4.18.3.2 but not listed here.

Big Game. Under the SS Alternative, up to 16 well pads/section could be developed on portions of moose crucial winter/yearlong range, pronghorn crucial winter range and mule deer crucial and noncrucial winter ranges. There are 12,975 acres of pronghorn crucial winter range on the anticline crest in which there are 283 potential well pad locations. Similarly for mule deer, there are 21,047 acres in winter range and crucial winter range on the Crest and together, 481 potential well pads are located there. Only 2,568 acres of the anticline crest with 52 potential well pad locations coincide with moose crucial winter/yearlong range. It is possible that all well pad sites in any of these big game habitats could be developed to densities of 16 well pads/section regardless of the level of development, 500 or 700 producing well pads. It is also possible, but unlikely, that no new well pads would be located within any big game crucial ranges.

Of the total potential well pad locations in each big game range on the anticline crest, 248 pads in pronghorn crucial winter range, 460 on mule deer winter and crucial winter range, and 10 pads on moose crucial winter/yearlong range are on Federal lands and minerals so they would be subject to BLM's standard stipulations with no exploration or drilling

activities during winter allowed. But once drilled and under production, wells would be accessed during winter while big game animals are on their crucial ranges.

Sage Grouse. There are 20 known sage grouse leks within the anticline crest, all but 1 are on Federal lands and minerals. Standard stipulations would avoid any surface activities or above ground structures within 0.25 mile of each lek on Federal lands and minerals and that would protect 19 leks. BLM stipulations also will avoid surface disturbing activities within 2 miles of each lek between March 1 and June 30 to avoid disturbing sage grouse courtship displays on leks and grouse nesting within that 2 mile radius.

Once lek attendance and nesting periods end, roads and wells may be located anywhere in a 2-mile radius but not within 0.25 mile of a lek. Consequently, there are 46,752 acres in the anticline crest that fall outside of the 0.25 mile buffer but within 2 miles of a lek and within which there are 1,117 potential well pad locations. So, whether 500 or 700 well pads are developed under this alternative, there is an excellent chance that all could be within 2 miles of a sage grouse lek. Once wells are operational, maintenance activities would occur during the lek attendance and nesting periods.

Raptor Nests. There are 20 known raptor nests within the anticline crest. BLM standard stipulations avoid placement of well pads, roads and any other facilities requiring human presence within 825 feet of all nests on Federal lands and minerals that have been active during one of the past three years. Thirteen of the nests would be protected by this stipulation but 7 nests on non-Federal lands would not and there are 8 potential well pad locations within 0.25 mile of those 7 nests. All of those locations could be developed, whether 500 or 700 well pads occurred on the project area.

BLM also would avoid construction during nesting potentially from February 1 through July 31 within one mile of occupied ferruginous hawk and bald eagle nests and within 0.5 mile of nests occupied by other species, construction-related impacts would be reduced. There are 25 potential well pad locations in wetlands on private and state-owned land that, if constructed, could affect raptors that forage primarily in wetlands. In addition, impacts to nest structures could occur on these lands because BLM cannot

restrict development in the vicinity of nest sites on private lands.

Other Terrestrial Wildlife. The only certain impact to other terrestrial wildlife by construction and operation of this alternative is loss of vegetation and habitats. With 50.1 percent of the anticline crest covered by high density sagebrush and an additional 30.2 percent covered by low density sagebrush, passerine birds that are obligate shrub-steppe nesting species would be most affected. A greater proportion of the anticline crest is covered with sagebrush steppe than proportional occurrence of that vegetation on the PAPA (see Table 4-40) and thus, development restricted to the Crest is expected to affect sagebrush-dependent species proportionally more than in the Project Wide Scenario. However, fewer total acres of sagebrush would be affected by the Anticline Crest Scenario, primarily because roads and pipelines would be less extensive. Loss of shrubs and fragmentation of shrub-dominated habitats would be short- and long-term impacts to these birds and possibly to some small mammal species as well.

There are approximately 2,081 acres of white-tailed prairie dog colonies within the anticline crest. Standard stipulations applicable to other resources would avoid well pads on 768 acres but well pad densities could reach 16 pads/acre on 1,313 acres of prairie dog colonies. Construction activities that compress or eliminate burrows would adversely affect the inhabitants, prairie dogs as well as other vertebrate species. No species classified as SSC 1, 2, or 3 by WGFD are likely to inhabit white-tailed prairie dog burrows.

Aquatic Resources. While there would be no well pads located within 100 feet of intermittent streams or 500 feet of wetlands and perennial streams on Federal lands and minerals, there are 25 potential well locations on non-Federal lands and minerals that could be developed within the 500 foot buffer on the anticline crest. Also, 32 potential well pad locations on non-Federal lands and minerals are within the 100-year flood plain. If any or all of these well sites are developed, the potential for significant impacts to streams and fisheries would exist from sedimentation impacts and other potential sources of water quality degradation (i.e., spills, loss of streambank vegetation and scrub-shrub and forested wetlands).

RP Alternative on Federal Lands and Minerals.
Management objectives for sensitive wildlife habitats

on the anticline crest would include all of those spatial and temporal restrictions listed above for the SS Alternative. However, there are additional resource protection measures that would be applied to wildlife habitats on Federal lands and minerals; they are noted in Section 4.19.3.2. In addition, other resource protection measures that protect other resources by a) avoiding well pad placement in specific areas, and b) limiting well pad densities in specific areas would also provide protection and limit well pad drilling in wildlife habitats used by other wildlife species. Those protection measures are in Table 2-8 and included in the discussion in Section 4.18.3.2.

Big Game. With this RP Alternative, there would be no more than four well pads/section in any of the big game crucial winter ranges on Federal lands and minerals. There are 11,633 acres of pronghorn crucial winter range on the anticline crest that would be subject to this limitation. Potentially, 62 well pads spaced on every 160 acres could be constructed in pronghorn crucial winter range. There are 35 potential well pad locations within pronghorn crucial range on non-Federal lands and minerals that could be developed at densities of 16 pads/section, whether at the 500 or 700 well pad development level. But as noted above, there might be no well pads within pronghorn crucial winter range.

There are 20,185 acres of mule deer winter and crucial winter ranges on which well pads would be limited to 4 pads/section so that 115 pads might be constructed at that density on the anticline crest. And, 1,015 acres of moose crucial winter/yearlong habitat would also be limited to 4 well pads/section allowing for up to 10 pads in that habitat subject to the limitation. Conceivably, 42 additional well pads placed on every 40 acres could be constructed within the remainder of moose crucial range on non-Federal lands and minerals, whether levels of 500 or 700 well pads are developed. Likewise, well pad densities could reach 16 pads/section within 862 acres of mule deer winter habitats on non-Federal lands and minerals so that 21 potential well pad locations within the remaining mule deer winter habitat on the anticline crest could be at that density. The area described as the Mesa "Breaks" is shown in Figure 4-9. It includes approximately 3,427 acres of anticline crest and all is within Federal lands or minerals.

Sage Grouse. As for the RP Alternative in the Project Wide Scenario, noise levels would be controlled to 10 dBA above ambient levels during the lek attendance period at all sage grouse leks on

Federal lands and minerals would likely produce less impact to the 19 sage grouse leks on those lands on the anticline crest. There is only 1 lek on non-Federal lands and minerals on the anticline crest that would not be subject to this constraint. The RP Alternative provides more protection and less impact to leks than the SS Alternative.

The RP Alternative on Federal Lands and Minerals potentially limits the impacts described to sage grouse nesting habitat compared to the SS Alternative by limiting 4 well pads/section within two miles of any sage grouse lek and within high quality nesting habitat predicted by the model designed to evaluate nesting habitat. Even so, there are 106 potential well pad sites within a 2-mile radius of leks on non-Federal lands and minerals that could be developed up to 16 well pads/section. With that possibility, impacts to sage grouse nesting habitat would probably be significant for the same reasons reported for the SS Alternative.

Raptor Nests. The RP Alternative would diminish the likelihood of significant impacts that could occur under the SS Alternative by increasing the surface occupancy restriction from 825 feet to 1,000 feet around ferruginous hawk nests. The effectiveness of this measure is not known but surely would improve the chance of nesting success for the species. However, the potential for significant impacts to other nesting raptors on non-Federal lands and minerals would remain under this alternative since there are at least 8 nests for which there would be no resource protection measures applied.

Other Terrestrial Wildlife. Similar to discussions of impacts to habitats potentially used by listed threatened and endangered species (bald eagles, black-footed ferrets) and proposed species (mountain plovers) in Section 4.18.3.2 - RP Alternative on Federal Lands and Minerals - there are resource protection measures that protect other resources and would provide some levels of protection to wildlife habitats that, otherwise have no protection *per se*. Of the 2,081 acres of prairie dog colonies on the anticline crest, standard stipulations and resource protection measures for other resources would avoid well pads on 768 acres and would limit well pad densities to 4 pads/section on 1,313 acres so that no area on prairie dog colonies would be subject to 16 well pads/section in this alternative (see Section 4.18.3.3 for a more detailed analysis). Consequently, the RP Alternative is expected to generate fewer

impacts to wildlife and habitats project wide than the SS Alternative.

Aquatic Resources. This alternative would not reduce the potential for significant impacts discussed above for the SS Alternatives because no restrictions would be applied to development on non-Federal lands and minerals: 25 potential well pad locations could be developed in wetlands and/or 32 could be developed within the 100-year flood plain.

Pad Drilling. Pad drilling could be implemented on 11,633 acres of pronghorn crucial winter range, 20,185 acres of mule deer winter and crucial winter range, 1,015 acres of moose crucial winter/yearlong range, and 42,799 acres between 0.25 miles and 2-miles of sage grouse leks on the anticline crest that, because of resource protection measures, would be limited to development of 4 well pads/section. The remaining areas of these wildlife habitats on non-Federal lands and minerals in the PAPA could be maximally developed to 16 well pads/section, drilled using conventional procedures.

If this approach is used, expected short-term disturbance to each wildlife habitat affected would probably be larger than under the SS Alternative since surface disturbances would amount to 5 acres/well pad for multiple well pads as opposed to 3.7 acres/well pad for single well pads. Likewise, long-term impacts would be greater since each multiple well pad would be reclaimed to 2.5 acres while single well pads would be reclaimed so that 1.5 acres would be disturbed. Consequently, more surface disturbance would occur with this option because of the larger surface area required for each multiple well pad than would occur under the SS Alternative.

Centralized Production Facilities. Development of centralized production facilities in any of the big game wintering and sage grouse nesting habitats discussed, above has the potential to increase short-term impacts: up to 16 well pads/section could be developed on any area on which stipulations and/or resource protection measures fully avoid surface disturbances. Each centralized production facility would disturb 5 acres over the short- and long-term. However, each of the well pads developed under this plan could be reclaimed to where only 0.5 acre would remain disturbed over the long-term. And, human presence at each of the well pads would be reduced or nearly eliminated over the long-term.

RP Alternative on All Lands and Minerals.

Management objectives would include all of those spatial and temporal restrictions listed above for the SS Alternative and RP Alternative for Federal Lands and Minerals. However, all management objectives would be applied to all lands within the anticline crest, including state and private lands and minerals in the project area under this alternative. On non-Federal lands and minerals, these management objectives would have to be voluntarily applied by the operators.

Big Game. With this alternative, there would be no more than 4 well pads/section in pronghorn crucial winter range on all lands within the entire anticline crest. However, the impacts to crucial pronghorn winter range discussed under the RP Alternative for Federal Lands and Minerals would be nearly identical for this alternative except overall local densities of well pads, roads and gathering pipelines would be lower. All 12,975 acres of pronghorn crucial winter range on the anticline crest would be subject to this limitation. Potentially, 71 well pads spaced apart on every 160 acres could be constructed in pronghorn crucial winter range. The remaining wells pads, 429 if the development level is 500 well pads and 629 well pads if 700 pads are to be implemented, would have to be on areas outside of pronghorn crucial winter range and could be developed at densities of 16 pads/section if those areas do not coincide with other resource protection zones.

There are 21,047 acres of mule deer winter and crucial winter ranges on which well pads would be limited to 4 pads/section so that 120 pads might be constructed at that density. And, 2,568 acres of moose crucial winter/yearlong habitat would also be limited to 4 well pads/section allowing for up to 13 pads in that habitat subject to the limitation. If maximum development occurs on either big game range, the balance of well pads would be located out of that range whether levels of 500 or 700 well pads are developed. By limiting development density to no more than four well pads/section throughout these big game crucial ranges, the potential for significant impacts to wintering animals would be greatly reduced. Further reduction of impact would come about through the resource protection measure that limits the number of drilling rigs on the PAPA to 5 present at any one time and with just 2 rigs operating north of the New Fork River.

Sage Grouse. Impacts to sage grouse leks would probably be less than those described for the RP Alternative on Federal Lands and Minerals since the

one lek on non-Federal lands and minerals would be subject the noise limitations. This alternative potentially limits the impacts described to sage grouse nesting habitat compared to the two previous alternatives since all areas within 46,752 acres lying between 0.25 mile and 2 miles of leks would be limited to 4 well pads/section. That same limitation would extend throughout high quality sage grouse nesting habitat, predicted by the sage grouse nesting habitat model (with between 80 and 100 percent certainty that the habitat is suitable) but up to 8 well pads/section would be allowed on lower quality habitat, regardless of land or minerals ownership.

Raptor Nests. This alternative would eliminate some potential significant impacts to raptor nests located on non-Federal lands and minerals in the project area, particularly ferruginous hawk nests on non-Federal land.

Other Terrestrial Vertebrates. Impacts to other terrestrial vertebrates would be similar to those discussed under the SS Alternative. Local well pad densities would be reduced in upland habitats due to constraints associated with mule deer and pronghorn crucial winter ranges and sage grouse nesting habitats and application of those constraints on non-Federal lands and minerals. And, resource protection measures that protect other resources would provide some levels of protection to wildlife habitats that, otherwise have no protection *per se*. Consequently, the RP Alternative is expected to generate fewer impacts to wildlife and habitats project wide than the RP Alternative on Federal Lands and Minerals and SS Alternative. Potential impacts to wetland habitats would be significantly reduced by this alternative because well pads would not be developed within 500 feet of wetlands, riparian areas, or perennial streams.

Aquatic Resources. Impacts to fisheries would be significantly reduced with this RP Alternative because well pads would not be developed within 500 feet of any wetlands, riparian areas, or perennial streams or within the 100-year flood plain.

Pad Drilling. Pad drilling on the anticline crest could be implemented on all 12,975 acres of pronghorn crucial winter range, 21,047 acres of mule deer winter and crucial winter range, 2,568 acres of moose crucial winter/yearlong range, and 46,752 acres between 0.25 mile but within 2-miles of sage grouse leks that, because of resource protection measures, would be limited to development of 4 well pads/section. If this approach is used, more surface

disturbance would occur with this option because of the larger surface area required for each multiple well pad than would occur under the RP Alternative.

Pad drilling, however, would concentrate human activities more than single well pads for the same number of producing wells. Four wells could be drilled on each pad so that a significant amount of project-related disturbance could occur within just pronghorn crucial winter range (283 wells on 71 pads) or just within mule deer winter and crucial winter range (481 wells on 120 pads) whether 500 or 700 wells were drilled under this option. Since, only 13 well pads could be located in moose crucial winter/yearlong range, 52 wells could be drilled there with the balance of development to reach 500 or 700 wells occurring somewhere else. And, all multiwell pad development could occur between 0.25 mile and 2 miles of sage grouse leks on the anticline crest.

Centralized Production Facilities. Development of centralized production facilities in any of the big game wintering and sage grouse nesting habitats discussed above has the potential to increase short-term impacts: up to 16 well pads/section could be developed on any area on which stipulations and/or resource protection measures fully avoid surface disturbances. Each centralized production facility would disturb 5 acres over the short- and long-term. However, each of the well pads developed under this plan could be reclaimed to where only 0.5 acre would remain disturbed over the long-term. And, human presence at each of the well pads would be reduced or nearly eliminated over the long-term.

4.19.3.4 No Action Exploration/Development Scenario. Implementation of the No Action Exploration/Development Scenario would eliminate project-related impacts to wildlife that have been described above. However, impacts described as secondary or indirect in Table 4-45 would be expected to continue with any additional human population growth in the region.

4.19.4 Additional Mitigation Measures. The following measures would reduce potential impacts to wildlife and aquatic resources. The BLM can impose measures 7 through 17 and 19 on Federal lands. Adoption of all other measures would require input by other governmental entities or would be strictly voluntary on the part of the operator.

Wildlife Mitigation Opportunity 1. To minimize poaching, the operators should provide all project-

related personnel with information about state and Federal game laws. The operators and their contractors should adopt a policy of avoiding firearms at work sites.

Wildlife Mitigation Opportunity 2. The operators and their contractors should adopt a policy to require all motorized equipment to be adequately muffled to minimize noise levels.

Wildlife Mitigation Opportunity 3. The operators and their contractors should require all workers to be housed off-site and off public lands. Squatting should be strongly discouraged by the operators and their contractors.

Wildlife Mitigation Opportunity 4. Poaching may increase in the project area. The operators should work with WGFD on a program to offer a reward for information leading to the arrest of poachers.

Wildlife Mitigation Opportunity 5. Similar to other projects that have been developed on public lands in southwest Wyoming in the recent past, the operators and their contractors should adopt a policy of prohibiting dogs at work sites to reduce harassment of wildlife.

Wildlife Mitigation Opportunity 6. The operators and their contractors should adopt a policy of limiting all post-construction traffic to roads specifically identified for access to project sites and avoid use of those roads by the general public. Project-related traffic should be excluded on all other existing roads in the project area.

Wildlife Mitigation Opportunity 7. In cooperation with BLM, the PAPA operators could:

1. Develop a road management plan that would identify roads that would be closed to the public, especially during winter and spring. Wildlife habitat models for mule deer and pronghorn winter range habitat and sage grouse nesting habitat could be utilized to identify areas that would most benefit by road closure during the respective seasons.
2. Identify unnecessary roads within the project area that could be reclaimed and where abandoned well pads and other well-field facilities have not been adequately reclaimed. Wildlife habitat models (pronghorn winter habitat, mule deer winter habitat, sage grouse nesting habitat) could

be used to identify and prioritize areas that would most benefit by renewed reclamation.

3. Consider permanently closing the south end of the Mesa Road (State Highway 351 to BLM Road 5106); to protect antelope, mule deer and sage grouse. Consider seasonally closing BLM Road 5106 to protect wintering mule deer and strutting sage grouse.
4. Construct all roads to standards that minimize vehicle speeds and surface disturbances.
5. Identify and correct where newly constructed and existing roads within their transportation network will intersect two-track roads that create barriers.
6. Fence reclaimed sites where impact from cattle and sheep grazing or where wildlife use is a concern. However, all new fences constructed should be designed to not restrict big game movements.
7. Evaluate existing stock ponds within their project area and make improvements, where necessary, so they will retain water for use by wildlife. Improvements could include dam reconstruction and installation of snow fences in stock pond drainages to enhance water sources. Wildlife habitat models could be used to identify and prioritize areas where stock pond improvements would be most beneficial.
8. Consider constructing wildlife guzzlers within key sage grouse nesting habitats and key pronghorn summer range habitats that would be fenced to prevent livestock use. Wildlife habitat models (pronghorn summer habitat, sage grouse nesting habitat) could be used to identify and prioritize areas that would most benefit from new water sources.
9. Consider drilling water wells for wildlife use. Wells should have capabilities for seasonal function so that they would not retain wildlife on inappropriate seasonal ranges. Wildlife habitat models (pronghorn summer habitat, sage grouse nesting habitat) could be used to identify and prioritize areas that would most benefit from new water sources.

Wildlife Mitigation Opportunity 8. Avoid constructing roads and pipelines through locally limited vegetation types, including aspen and mountain shrub communities.

Wildlife Mitigation Opportunity 9. Pipelines paralleling stream drainages should be at least outside the 100-year flood plain. Where pipelines cross stream channels, routes should be at right angles to the stream.

Wildlife Mitigation Opportunity 10. To the extent possible, bury powerlines. Where not possible, they should be located as suggested in Appendix A, Section A-2.

Wildlife Mitigation Opportunity 11. If roads must be plowed during winter, insure that there are frequent openings to allow wildlife trapped in berms to escape. Avoid plowing snow onto snow-free areas - southeast to west facing slopes - that provide wildlife, especially big game, areas of relatively low thermal stress during winter.

Wildlife Mitigation Opportunity 12. Within big game winter ranges, the operators should consider confining well site visits to mid-day (10 a.m. to 3 p.m.) during winter (November 15 to April 30) to avoid disrupting big game during principal feeding periods and periods of high thermal stress.

Wildlife Mitigation Opportunity 13. The operators should consider not placing roads or constructing well pads in sage grouse nesting habitats with high probabilities of suitability, primarily high density sagebrush within 8 miles of a known sage grouse lek. If well pads are constructed within that area, place visual and/or noise screens to protect high quality nesting habitat. The BLM should develop a set of guidelines for the operators and resource specialists in charge of routing roads to avoid these areas.

Wildlife Mitigation Opportunity 14. In cooperation with BLM and WGFD, the operators should consider constructing nesting structures for use by ferruginous hawks and golden eagles in areas where no suitable nesting substrates are present, where there are no conflicts with sage grouse leks, and in which no construction activities would occur.

Wildlife Mitigation Opportunity 15. In cooperation with BLM and WGFD, the operators should consider evaluating existing fences within the PAPA and Pinedale Resource Area to determine their suitability for mule deer and pronghorn passage and to modify fences that are within migration routes to provide the least deterrence to animal movements as possible. For example, the BLM, BP Amoco and WGFD should discuss modifications to the Pinedale/Rock Springs Field Area boundary fence in the vicinity of the proposed BP Amoco Field Office.

Wildlife Mitigation Opportunity 16. In situations and at locations to be specified by BLM, reserve pits

should be covered by netting if they present a threat to migratory waterfowl.

Wildlife Mitigation Opportunity 17. The operators should control fugitive dust from all project-related activities.

Wildlife Mitigation Opportunity 18. The operators could consider off-site mitigation to enhance wildlife habitats elsewhere that may compensate for habitats lost on the project area. If on-site mitigation is not possible, then consider habitat enhancement (or other appropriate mitigation) on adjacent sites before considering more distant sites. To that end the operators should establish a compensatory mitigation fund to replace lost wildlife habitat. A fee should be paid by each operator for each well that is drilled in one or more of the wildlife SRMZs in the project area. The operators should work with environmental groups active in the area to establish the administrative requirements for managing such a program.

Wildlife Mitigation Opportunity 19. BLM should consider not reissuing leases in crucial winter ranges if they expire.

Aquatic Resource Mitigation Opportunity 1. To protect fisheries, particularly spawning brown trout, water withdrawals and instream construction activities should not occur between September 15 and November 30 in streams containing trout.

4.19.5 Monitoring Requirements. BLM standard stipulations attached to each APD will limit impacts to wintering big game, sage grouse on leks, and nesting raptors. In order to effectively implement these stipulations as mitigation measures, surveys for sage grouse leks and raptor nest sites within the PAPA are needed. The following monitoring requirements are recommended. It is anticipated that the results of the monitoring program would be shared with all interested parties during the annual development review as outlined in Appendix F. BLM and the cooperating agencies lack the resources to adequately implement the monitoring programs recommended below and specified in Appendix F. While the BLM and cooperating agencies need to be thoroughly involved in all aspects of monitoring, the costs of these programs should be borne by the operators.

1. The wildlife habitat models (pronghorn, mule deer, sage grouse) should be revised with new

biological information that is currently being collected on the PAPA and vicinity, or studies conducted elsewhere providing useful information. If or when that information shows that probability levels derived from animal habitat selection differs from levels currently employed in the models, the new information should be integrated in the models to increase predictability of habitat evaluations.

activity on Federal lands while supplemental environmental impact analysis is completed.

2. The GIS layers used to catalog wildlife habitat data necessary for modeling should be maintained and updated as geographic and biological features change in terms of human settlements, topography, vegetation, use by domestic livestock and other herbivores.
3. As new roads, well pads, pipelines and other well field facilities are developed, their locations need to be digitized and included in GIS layers so that the wildlife habitat models can be used to continually evaluate the status of habitats in the PAPA. BLM should consider requiring operators to submit all locational information regarding pads, roads, pipelines, etc., in a format compatible with GIS analysis.
4. Through continual reiteration with new biological and well field development data, the models should allow managers to identify site-specific opportunities for mitigation, whether through habitat enhancement, changes in land use, or avoidance of new impacts altogether.
5. As traffic levels increase throughout the PAPA and vicinity, additional animal-vehicle collisions are expected. Wyoming Department of Transportation already monitors big game mortalities and traffic volume on some area highways. By expanding that effort to include well field access roads, sites could be identified where specific mitigation could be applied to reduce mortalities.
6. Continue to monitor key biological sites and events, including but not limited to raptor nesting success and nesting populations, sage grouse lek attendance and population trends, mule deer winter mortality and winter distribution, occupancy and health of prairie dog colonies and use of those colonies by other wildlife species.
7. Monitor revegetation success at all reclaimed sites and initiate remediation work as soon as possible.
8. Monitor level of development to ensure impacts to wildlife and other resources are consistent with the scope and analysis of the EIS. If impacts levels approach exceeding of any thresholds, consideration should be given to curtailing further